The Forum.

JULY, 1890.

FORMATIVE INFLUENCES.

In 1842, and thereabouts, it was my privilege to be a member of the Preston Mechanics' Institute—to attend its lectures and to make use of its library. A learned and accomplished clergyman, named, if I remember aright, John Clay, chaplain of the House of Correction, lectured from time to time on mechanics. A fine, earnest old man, named, I think, Moses Holden, lectured on astronomy, while other lecturers took up the subjects of general physics, chemistry, botany, and physiology. My recollection of it is dim, but the instruction then received entered, I doubt not, into the texture of my mind, and influenced me in after life. One experiment made in these lectures I have never forgotten. Surgeon Corless lectured on respiration, explaining, among other things, the changes produced by the passage of air through the lungs. What went in as free oxygen, came out bound up in carbonic acid. To prove this he took a flask of lime water, and, by means of a glass tube dipped into it, forced his breath through the water. The carbonic acid from the lungs seized upon the dissolved lime, converting it into carbonate of lime, which, being practically insoluble, was precipitated. All this was predicted beforehand by the lecturer; but the delight with which I saw his prediction fulfilled, by the conversion of the limpid lime

Copyright, 1889, by the Forum Publishing Company.

water into a turbid mixture of chalk and water, remains with me, as a memory, to the present hour.

At the invitation of an officer of the Royal Engineers, who afterward became one of my most esteemed and intimate friends, I quitted school in 1839, to join a division of the Ordnance Survey. The profession of a civil engineer having then great attractions for me, I joined the Survey, intending, if possible, to make myself master of all its operations, as a first step toward becoming a civil engineer. Draughtsmen were the best paid, and I became a draughtsman. But I habitually made incursions into the domains of the calculator and computer, and thus learned all their art. In due time the desire to make myself master of field operations caused me to apply for permission to go to the field. The permission was granted by my excellent friend, General George Wynne, who then, as Lieutenant Wynne, did all he could to promote my desire for improvement. Before returning to the office I had mastered all the mysteries of ordinary field work. But there remained a special kind of field work which had not been mastered—the making of trigonometrical observations. By good fortune some work of this kind was required at a time when all the duly-recognized observers were absent. Under the tutelage of a clever master, named Conwill, I had acquired, before quitting school, a sound knowledge of elementary geometry and trigonometry. Relying on this to carry me through, I volunteered to make the required observations. After some hesitation and a little chaff, a theodolite was confided to me.

The instrument embraces an accurately-graduated horizontal circle, for the measurement of horizontal angles, and a similarly-graduated vertical circle, for the taking of vertical angles. It is moreover furnished with a formidable array of clamp screws, tangent screws, and verniers, sufficient, at least, to tax a novice to unravel them. My first care, before applying the instrument, was to understand its construction. This accomplished, I took the field with two assistants, who had to measure up-hill and down-hill, along the sides of large triangles into which the whole country had been previously divided. At the same time angles of elevation had to be taken up-hill, and angles of depression

down-hill, and from these the true horizontal distance had to be calculated. The hights above the sea level of the corners of the large triangles had been previously fixed with the utmost accuracy by a very powerful theodolite, and the measurements with my smaller instrument had to come pretty close to the accurate determination to save my work from rejection. Happily I succeeded, though there had been bets against me. The pay upon the Ordnance Survey was very small—a little under twenty shillings a week. I have often wondered since at the amount of genuine happiness which a young fellow of regular habits, not caring for either pipe or mug, may extract from pay like this.

Then came a pause, and after it the mad time of the railway mania, when I was able to turn to some account the knowledge gained upon the Ordnance Survey. In Staffordshire, Cheshire, Lancashire, Durham, and Yorkshire, more especially the last, I was in the thick of the fray. It was a time of terrible toil. The day's work in the field usually began and ended with the day's light, while frequently in the office there was little difference between day and night, every hour of the twenty-four being absorbed in the work of preparation. The 30th of November was the latest date at which plans and sections of projected lines could be deposited at the Board of Trade. One of my last pieces of field work in those days was the taking of a line of levels from the town of Keighley to the village of Haworth, in Yorkshire. On a certain day, under grave penalties, these levels had to be finished, and this particular day was one of agony to me. The atmosphere seemed filled with mocking demons, laughing at the vanity of my efforts to get the work done. My leveling staves were snapped, and my theodolite was overthrown by the storm. When things are at their worst, a kind of anger often takes the place of fear. It was so in the present instance; I pushed doggedly on, and just at nightfall, when barely able to read the figures on my leveling staff, I planted my last "bench mark" on a tombstone in Haworth churchyard. Close at hand was the vicarage of Mr. Brontë, where the genius was nursed that soon afterward burst forth and astonished the world.

Among the legal giants of those days, Austin and Talbot stood supreme. There was something grand, as well as merci-

less, in the power wielded by those men in entangling and ruining a hostile witness; and yet it often seemed to me that a clear-headed fellow, who had the coolness, honesty, and courage not to go beyond his knowledge, might have foiled both of them. Then we had the giants of the civil engineers—Stephenson, Brunel, Locke, Hawkshaw, and others. Strong men were broken down by the strain and labor of that arduous time. Many pushed through, and are still among us in robust vigor. But some collapsed, while others retired, with large fortunes it is true, but with intellects so shattered that, instead of taking their places in the front rank of English statesmen, as their abilities entitled them to do, they sought rest for their brains in the quiet lives of country gentlemen. In my own modest sphere, I well remember the refreshment occasionally derived from five minutes' sleep on a deal table, with Babbage and Callet's "Logarithms" under my head for a pillow.

It was a time of mad unrest—of downright monomania. In private residences and public halls, in London reception rooms, in hotels and the stables of hotels, among gypsies and costermongers, nothing was spoken of but the state of the share market, the prospects of projected lines, the good fortune of the hostler or pot boy who, by a lucky stroke of business, had cleared ten thousand pounds. High and low, rich and poor, joined in the reckless game. During my professional connection with railways I endured three weeks' misery. It was not defeated ambition; it was not a rejected suit; it was not the hardship endured in either office or field; but it was the possession of certain shares which I had purchased in one of the lines then afloat. The share list of the day proved the winding sheet of my peace of mind. I was haunted by the Stock Exchange. Then, as now, I loved the blue span of heaven; but when I found myself regarding it morning after morning, not with the fresh joy which, in my days of innocence, it had brought me, but solely with reference to its possible effect, through the harvest, upon the share market, I became so savage with myself, that nothing remained but to go down to my brokers and to put away the shares as an accursed thing. Thus began and thus ended, without either gain or loss, my railway gambling.

During this arduous period of my life, my old tendencies, chief among which was the desire to grow intellectually, did not forsake me; and, in 1847, when railway work slackened, I accepted a post as master in Queenwood College, Hampshire. There I had the pleasure of meeting Dr. Frankland, who had charge of the chemical laboratory. Queenwood College had been the Harmony Hall of the Socialists, which, under the auspices of the philanthropist Robert Owen, was built to inaugurate the Millennium. The letters "C. of M." (Commencement of Millennium) were actually inserted, in flint, in the brickwork of the house. At Queenwood I learned, by practical experience, that two factors go to the formation of a teacher. In regard to knowledge, he must, of course, be master of his work. But knowledge is not all. There may be knowledge without power—the ability to inform without the ability to stimulate. Both go together in the true teacher. A power of character must underlie and enforce the work of the intellect. There are men who can so rouse and energize their pupils, so call forth their strength and the pleasure of its exercise, as to make the hardest work agreeable. Without this power, it is questionable whether the teacher can ever really enjoy his vocation; with it, I do not know a higher, nobler, more blessed calling than that of the man who, scorning the "cramming" so prevalent in our day, converts the knowledge he imparts into a lever, to lift, exercise, and strengthen the growing minds committed to his care.

At the time here referred to I had emerged from some years of hard labor the fortunate possessor of two or three hundred pounds. By selling my services in the dearest market, during the railway madness, the sum might, without dishonor, have been made a large one; but I respected ties which existed prior to the time when offers became lavish and temptation strong. I did not put my money in a napkin, but cherished the design of spending it in study at a German university. I had heard of German science, while Carlyle's reference to German philosophy and literature caused me to regard them as a kind of revelation from the gods. Accordingly, in the autumn of 1848, Frankland and I started for the land of universities.

Our place of study was the town of Marburg, in Hesse Cassel;

and a very picturesque town Marburg is. It clambers pleasantly up the hillsides, and falls as pleasantly toward the Lahn. On a May day, when the orchards are in blossom, and the chestnuts clothed with their heavy foliage, Marburg is truly lovely. It has, moreover, a history. It was here that Saint Elizabeth shed her holy influence and dispensed her mercies. The noble double-spired church which bears her name and contains her dust, stands here to commemorate her. On a high hill top which dominates the town, rises the fine old castle where, in the Rittersaal, Luther and Zwingli held their famous conference on Consubstantiation and Transubstantiation. Here, for a time, lived William Tyndale, first translator of the New Testament into English, who was afterward strangled and burnt in Vilvorden. Here Wolff expounded his philosophy; and here Denis Papin invented his digester, and is said to have invented a working steam engine. The principal figure in the university at the time of our visit was Bunsen, who had made his name illustrious by chemical researches of unparalleled difficulty and importance, and by the successful application of chemical and physical principles to explain the volcanic phenomena of Iceland. It was he, for example, who first laid bare the secret of the geysers, and gave the true theory of their action. A very worthy old professor named Gerling kept the observatory and lectured on physics. Professor Stegmann, an excellent teacher, lectured on mathematics; Ludwig and Fick were at the Anatomical Institute; Waitz lectured on philosophy and anthropology; Hessel expounded crystallography; while my accomplished friend Knoblauch arrived subsequently from Berlin. The university at the time numbered about three hundred students, and it suited my mood and means far better than one of the larger universities.

My study was warmed by a large stove. At first I missed the gleam and sparkle from flame and ember, but soon became accustomed to the obscure heat. At six in the morning a small *milchbrod* and a cup of tea were brought to me. The dinner hour was one, and for the first year or so I dined at a hotel. Our dinner consisted of several courses, roast and boiled, and finished up with sweets and dessert. The cost was a pound a month, or about eightpence per dinner. I usually limited myself

to one of the courses, using even it in moderation, being already convinced that eating too much was quite as sinful, and almost as ruinous, as drinking too much. Watch and ward were therefore kept over the eating. By attending to such things I was able to work without weariness for sixteen hours a day.

Early risers are sometimes described as insufferable people. They are, it is said, self-righteous—filled with the pharisaical "Lord, I thank Thee that I am not as other men are!" It may be so; but we have now to deal, not with generalizations, but with facts. My going to Germany had been opposed by some of my friends as quixotic, and my life there might, perhaps, be not unfairly thus described. I did not work for money; I was not even spurred by "the last infirmity of noble minds." I had been reading Fichte, and Emerson, and Carlyle, and had been infected by the spirit of these great men. Let no one persuade you that they were not great men. The Alpha and Omega of their teaching was loyalty to duty. Higher knowledge and greater strength were within reach of the man who unflinchingly enacted his best insight. It was a noble doctrine, though it may sometimes have inspired exhausting disciplines and unrealizable hopes. At all events it held me to my work, and in the long cold mornings of the German Winter, defended by a *Schlafrock* lined with catskin, I usually felt a freshness and strength—a joy in mere living and working, derived from perfect health—which was something different from the malady of self-righteousness.

I attended the lectures of many of the eminent men above mentioned, concentrating my chief attention, however, on mathematics, physics, and chemistry. One would like to have an opportunity of subjecting these lectures, especially those of Bunsen, to a riper judgment than mine was at that time. I learnt German by listening to Bunsen, and as my knowledge of the language increased, the lectures grew more and more fascinating. But my interest was alive from the first, for Bunsen was a master of the language of experiment, thus reaching the mind through the eye as well as through the ear. The lectures were full of matter. Notes of them are still in my possession which inform me how full they were, and how completely they were kept abreast of the most advanced knowledge of the day. Bunsen was a man of

fine presence, tall, handsome, courteous, and without a trace of affectation or pedantry. He merged himself in his subject; his exposition was lucid, and his language pure; he spoke with the clear Hanoverian accent which is so pleasant to English ears; he was every inch a gentleman. After some experience of my own, I still look back on Bunsen as the nearest approach to my ideal of a university teacher. He sometimes seemed absent-minded, and as he gazed through the window at the massive Elisabethen Kirche, appeared to be thinking of it, rather than of his lecture. But there was no interruption, no halting or stammering to indicate that he had been for a single moment forgetful. He lectured every day in Winter, and twice a day in Summer, beginning his course on organic chemistry at seven in the morning. After the lectures, laboratory work continued till noon. Dr. Debus, the distinguished professor of chemistry at the Royal Naval College, Greenwich, was Bunsen's laboratory assistant at this time, and to him I was indebted for some lessons in blow-pipe chemistry. Bunsen afterward took me under his own charge, giving me Icelandic trachytes to analyze, and other work. Besides being a chemist, he was a profound physicist. His celebrated *Publicum* on electro-chemistry, to which we all looked forward as a treat of the highest kind, was physical from beginning to end. He was the intimate friend of W. Weber of Göttingen, and was well acquainted with the labors of that great electrician. Breaking ground in frictional electricity, he passed on to the phenomena and theory of the voltaic pile. He was a great upholder of the contact theory, which had many supporters in Germany at the time, one of the foremost of these being the genial-minded Kohlrausch. There are no doubt eminent philosophers among us who would pronounce the theory, in its first form, unthinkable, inasmuch as it implied the creation of force out of nothing; but the fact that some of the most celebrated scientific men in the world, with the illustrious Volta himself as their leader, accepted and saw nothing incongruous in it, shows how "unthinkability" depends upon the state of our knowledge. The laws of Ohm were expounded with great completeness by Bunsen. Various modes of electric measurement were illustrated; the electric light from the carbon battery, invented by himself, was

introduced; the electric telegraph was explained; Steinheil's researches in regard to the "earth circuit" were developed; and it was in these lectures that I first heard an honoring and appreciative reference to the "*Englische Bierbrauer*," Joule.

Stegmann, the professor of mathematics, was also a man of strong individuality. He lectured in a small room on the flat which he occupied. This was the usual arrangement: each professor had a lecture room on his own floor, and the students, in passing from lecture to lecture, had sometimes to go from one end of Marburg to the other. The desks were of the most primitive description, and into them the inkhorns were securely fixed by means of spikes at the bottom. Besides attending his lectures, I had private lessons from Professor Stegmann. He was what I have already described him to be, an excellent teacher. He lectured on analysis, on analytical geometry of two and three dimensions, on the differential and integral calculus, on the calculus of variations, and on theoretical mechanics. In mathematics he appeared to be entirely at home. I have sometimes seen him, after he had almost wholly covered his blackboard with equations, suddenly discover that he had somewhere made a mistake. When this occurred he would look perplexed, shuffle his chalk vaguely over the board, move his tongue to and fro between his lips, until he had hit upon the error. His face would then flush, and he would dash forward with redoubled speed and energy, clearing every difficulty up before the end of the lecture. It was he who gave me the subject of my dissertation when I took my degree. Its title in English was, "On a Screw Surface with Inclined Generatrix, and on the Conditions of Equilibrium on such Surfaces." One evening, after he had given me this subject, I met him at a party, and asked him a question which I did not dream of as touching the solution of the problem. But he smiled and said, "Yes, Herr Tyndall; but if I tell you that, I must tell you a great deal more." I thought he meant to insinuate that I wished for illegitimate aid in the working out of my theme. I shrank together, and resolved that if I could not, without the slightest aid, accomplish the work from beginning to end, it should not be accomplished at all. Wandering among the pine woods, and pondering the subject, I be-

came more and more master of it; and when my dissertation was handed in to the Philosophical Faculty, it did not contain a thought that was not my own.

One of my experiences at Marburg may be worth noting. For a good while I devoted myself wholly to the acquisition of knowledge; heard lectures and worked in the laboratory abroad, and studied hard at home. When a boy at school I had read an article, probably by Addison, on the importance of order in the distribution of our time, and for the first year or so my time was ordered very stringently, specified hours being devoted to special subjects of study. But in process of time I began the attempt of adding to knowledge as well as acquiring it. My first little physical investigation was on a subject of extreme simplicity, but by no means devoid of scientific interest—phenomena of a water jet. Among other things I noticed that the musical sound of cascades and rippling streams, as well as the sonorous voice of the ocean, was mainly if not wholly due to the breaking of air bladders entangled in the water. There is no rippling sound of water unaccompanied by bubbles of air. This inquiry was followed by others of a more complicated and difficult kind. Well, over and over again, after work of this description had begun, I found myself infringing my program of study. Discontent and self-reproach were the first result. But it was soon evident that a rigid ordering of time would now be out of place. You could not call up, at will, the spirit of research. It was like that other spirit which cometh when it listeth, and greater wisdom was shown in following out, at the time, a profitable line of thought, than in adhering to a fixed lesson plan. By degrees all discontent vanished, and I became acclimatized to my new intellectual conditions. Continuing to work strenuously, but happily, till the autumn of 1850, I then came to England, and there saw Faraday for the first time. But I soon returned to Germany, accompanied by my lifelong friend, Mr. Thomas Archer Hirst, late director of studies in the Royal Naval College.

Rumors of the great men of Berlin reached Marburg from time to time. Their names and labors were frequently mentioned in the lectures. Having previously learned that I should have the privilege of working there in the laboratory of Profes-

sor Magnus, to Berlin I went in the beginning of 1851. Magnus had made his name famous by physical researches of the highest importance. The finish and completeness of his experiments were characteristic. He was a wealthy man, and spared neither pains nor expense to render his apparatus not only effective but beautiful. His experiments on the deviation of projectiles may be noted as special illustrations here. But on everything he touched he sought to confer completeness. The last years of his life were, for the most part, occupied in a discussion with myself on one of the most difficult subjects of experimental physics—the interaction of radiant heat and matter in the gaseous state of aggregation. It was also my privilege to meet Dove, who was renowned in various ways as a physicist. He had won fame in optics, acoustics, and electricity, but his greatest labors were in the field of scientific meteorology. The two Roses were there, Heinrich and Gustav, genial and admirable men, the one a great chemist, the other a great geologist. I met Mitscherlich, whose researches in crystallographic chemistry and physics had rendered his name illustrious. With Ehrenberg I had various conversations on microscopic organisms. I wanted at the time some amorphous carbonate of lime, and thought that Ehrenberg's microscopic chalk shells might serve my purposes; but I was thrown back by learning that the shells, small as they were, were built of crystals smaller still. I made the acquaintance of Riess, the foremost exponent of frictional electricity, who more than once opposed to Faraday's radicalism his own conservatism as regards electric theory. Du Bois-Reymond was there at the time, full of power, both physical and mental. His fame had been everywhere noised abroad in connection with his researches on animal electricity. Du Bois-Reymond is now perpetual secretary to the Academy of Sciences, in Berlin, and his discourses before that learned body show that his literary power takes rank with his power as an investigator. At the same time I met Clausius, known all over the world through his researches on the mechanical theory of heat, whose first great paper on the subject I translated before quitting Marburg. Wiedemann was there, whose proper researches have given him an enduring place in science, and who has applied his vast powers of reading and

of organization to throwing into a convenient form the labors of all men and nations on voltaic electricity. Poggendorff, a very able experimenter, was also there. He is chiefly known in connection with the famous journal which so long bore his name.

From all these eminent men I received every mark of kindness, and formed with some of them enduring friendships. Helmholtz was at this time in Königsberg. He had written his renowned essay on the "Conservation of Energy," which I translated; and he had just finished his experiments on the velocity of nervous transmission, proving this velocity—which had previously been regarded as instantaneous, or, at all events, as equal to that of electricity—to be, in the nerves of the frog, only 93 feet a second, or about one twelfth of the velocity of sound in air of the ordinary temperature. In his own house, I had the honor of an interview with Humboldt. He rallied me on having contracted, in Germany, the habit of smoking, his knowledge on this head being derived from my little paper on a water jet, where the noise produced by the rupture of a film between the wet lips of a smoker is referred to. He gave me various messages to Faraday, declaring his belief that he (Faraday) had referred the annual and diurnal variation of the declination of the magnetic needle to their true cause—the variation of the magnetic condition of the oxygen of the atmosphere. I was interested to learn from Humboldt himself that, though so large a portion of his life had been spent in France, he never published a French essay without having it first revised by a Frenchman. In those days I not infrequently found it necessary to subject myself to a process which I called depolarization. My brain, intent on its subjects, used to acquire a set, resembling the rigid polarity of a steel magnet. It lost the pliancy needful for free conversation, and, to recover this, I used to walk occasionally to Charlottenburg or elsewhere. From my experiences at that time, I derived the notion that hard thinking and fleet talking do not run together.

The philosophers of Germany were men of the loftiest moral tone. In fact, they were preachers of religion as much as expounders of philosophy. Shall we say that from them the land took its moral color? It would be to a great extent true to say so; but it should be added that the German philosophers were

themselves products of the German soil, probably deriving the basis of their moral qualities from a period anterior to their philosophy. Let me cite an illustrative anecdote. In the summer of 1871 I met at Pontresina two Prussian officers—a captain and a lieutenant—who had come there to recruit themselves after the hurts and sufferings of the war. We had many walks and many talks together. It was particularly pleasant to listen to the way in which they spoke of the kindness and the sympathy shown by the French peasantry toward the suffering German soldiers, whether wounded or broken down upon the march. I once asked them how the German troops behaved when going into battle. Did they cheer and encourage each other? The reply I received was this: "Never in our experience has the cry, '*Wir müssen siegen*' (we must conquer) been heard from German soldiers; but in a hundred instances we have heard them resolutely exclaim, '*Wir müssen unsere Pflicht thun*' (we must do our duty)." It was a sense of duty rather than love of glory that strengthened those men and filled them with an invincible heroism. We in England have always liked the iron ring of the word "duty." It was Nelson's talisman at Trafalgar. It was the guiding star of Wellington. When, in his days of freshness and of freedom, he wrote his immortal ode on the death of the Duke of Wellington, our Laureate poured into the praise of Duty the full strength of his English heart:

"Not once or twice in our rough island-story
The path of duty was the way to glory:
He that walks it, only thirsting
For the right, and learns to deaden
Love of self, before his journey closes,
He shall find the stubborn thistle bursting
Into glossy purples, which outredden
All voluptuous garden roses.
Not once or twice in our fair island-story,
The path of duty was the way to glory."

JOHN TYNDALL.

A SHORT STUDY OF "HAMLET."

WHETHER Shakespeare, in writing to supply the demands of a contemporary stage, intended a philosophy no deeper than could be given forth and received at one presentation, matters little; the finding of the lesson in his works is all, and should content us. In the play of "Hamlet," the problem so clearly given and so hard to solve, is action as related to and affected by thought. For its solution we have not only Hamlet, lone wandering though not lost, sorely perplexed yet with choice enough to serve the differences of sense and ecstasy, but placed beside him in strong contrast to each other and him, we find two other characters, whose struggles with different phases of the theme throw light upon his own. In fact, for the purpose of moral teaching, "Hamlet" without Hamlet, would be but little worse than "Hamlet" without Laertes or Horatio.

Laertes practically illustrates impulse without judgment, action without thought. In the midst of the allurements and pleasures of the French court, Laertes hears of the death of his father, and in the flash of thought he sweeps to his revenge. With sedition roused and barking at his heels, he rushes into the presence of the king, braves his power, and demands his father:

> "I'll not be juggled with:
> To hell, allegiance! vows, to the blackest devil!
> Conscience, and grace, to the profoundest pit!
> I dare damnation: to this point I stand,—
> That both the worlds I give to negligence,
> Let come what comes; only I'll be revenged
> Most throughly for my father."

His text is Macbeth's:

> "The flighty purpose never is o'ertook
> Unless the deed go with it."

He would slay the king before his guilt is fixed; Hamlet could

not after. Reflection is not characteristic of Laertes; it comes only when his life blood is mingling with that of the unhappy prince who is dying by his side.

Midway between Laertes and Hamlet stands Horatio, the perfect man, whose mind is even and whose action just; whose passion is balanced by his reason and his deed by thought. Mark him:

> "Horatio, thou art e'en as just a man
> As e'er my conversation cop'd withal.
> . . . . . .
> Give me that man
> That is not passion's slave, and I will wear him
> In my heart's core, ay, in my heart of heart,
> As I do thee."

A man so passion-tempered and reflection-led, he stands beyond "the shot of accident or the dart of chance"; his "life is gentle, and the elements so mixed in him that nature might stand up and say to all the world, 'This is a man.'"

With these two in themselves well-marked figures, but serving as foils to set off his defect, stands Hamlet, wrapt in the pall of gloom and destiny, enacting an awful argument against that fatal weakness of the human mind—soul-harrowing hesitancy. Capable of conceiving great deeds, he parleys too long with time and consequence, and purpose palls. Prolific of intent, he is barren of fulfillment. He is thought without action. In the flush of excitement he swears to perform a terrible deed, from which in his calmer moments his whole nature recoils. Prompted within and without to an act of revenge, he falters in the face of action, and is all unmanned by weighing too long the issue. Superhuman power wrung from him the vow, and his whole after life wrought out philosophies against its execution. He vainly searched for means by which to do and yet not to do it; he sought to reconcile God's will with man's passion. The voice from the grave—petty in that it was human, but strong in being that of a beloved father—cries "Revenge! Revenge! Remember me!" while echoed from the thunders of Sinai comes the sterner voice, "Thou shalt not kill. Vengeance is mine, mine only. I will repay."

Divided thus against himself, hesitating between the instincts of nature and the revelations of divine law, striving to make accord between what he would and what he should not, essaying purposes that a higher power ever thwarts, he falters again and again, till at length aroused by very desperation, he takes life and yields his own, a victim of thought turned by excess to melancholy. This tendency of Hamlet Shakespeare shows in less ideal form in the utterances of many other characters. Brutus, Macbeth, Richard II., Iago, as they contemplate action, all speak of the halting, doubting overthought in which stagnate the powers of accomplishment.

Of himself, feeling too well the "different plague of each calamity," Hamlet says:

> "Now, whether it be
> Bestial oblivion, or some craven scruple
> Of thinking too precisely on the event,—
> A thought, which, quarter'd, hath but one part wisdom
> And ever three parts coward,—I do not know
> Why yet I live to say, 'This thing's to do.'"

How keenly, too, he must have felt the comment of the player king:

> "I do believe, you think what now you speak;
> But, what we do determine oft we break.
> What to ourselves in passion we propose,
> The passion ending, doth the purpose lose."

From the play we might quote many such passages, but these are sufficient to sound the key note of the terrible discord that cracked in the ring the music of Hamlet's life.

Nor was he a mere phlegmatic dreamer; his vehemence of passion is shown in

> "Haste me to know 't; that I, with wings as swift
> As meditation, or the thoughts of love,
> May sweep to my revenge."

And again he startles us with

> "Now could I drink hot blood,
> And do such bitter business as the day
> Would quake to look on."

His was a nature charged with the strong instincts of a northern race, but borne down by burdens too great for mortals

to bear. Behold him at the opening of the play, harassed with doubts concerning his father's death, shocked by the hasty marriage of his mother, his studies abruptly broken off, love's gentle course obstructed, and the general state menaced from without by war. Can we wonder then that "pale and yellow melancholy" had congealed the genial current of his blood, and "marked him for her own"?

Add to this the effect made by the dread appearance of his father's spirit, startling him into thoughts beyond the reach of his soul, and could we greatly wonder if he had been drawn indeed into very madness? But it was not so. True, in times of heavy gloom and dark despondency the balance of his mind dips deep, yet he maintains through all his reason's poise.

The question of Hamlet's insanity, though discussed to tediousness, has not, I think, been considered in the light of its full importance. It is in fact the main motive of the whole, animating every scene and situation. We ask then, Was our hero's insanity assumed or real? If assumed, it is as a silken cord threading the incidents of the play as dewy pearls in a priceless necklace. If real, it is as the waste hemp binding a life's loose deeds and thoughts as driftwood for the burning. The play then loses all interest of plot-development, the Prince becomes a mindless involuntary agent, and the events are but flotsam on the tide of time.

Yet many commentators whose writings show them to be in all else of healthy wit, insist upon his madness, and call in the keepers of the insane to declare, "How pregnant his replies sometimes are. A happiness that often madness hits upon, which reason and sanity could not so prosperously be delivered of." And in the very utterance, like new Poloniuses, they become the gulls of Hamlet's jesting. Such critics, in all good truth and merit, "deserve the whip as madmen do, and the reason they are not so punished and cured is" that the keepers they call in are themselves insane. For has it ever occurred to them to inquire how Hamlet could hope to deceive the court if he did not assume some of the forms of veritable madness? Madness is hardly the stuff of which, among many other things, his most profound soliloquies are made. It is not in madness that

he speaks so sagely to the players, nor so directly to his mother, when he lays aside his folly's mask and says:

> "It is not madness
> That I have utter'd: bring me to the test,
> And I the matter will re-word, which madness
> Would gambol from."

And later when he protests to her:

> "That I essentially am not in madness,
> But mad in craft."

Nor will the theory of an intermittent madness explain away these difficulties. It is but a poor shift to say that these are the utterances of lucid intervals in his delirium. Such interims of light may be of scientific truth, but in the plot of "Hamlet" they would be of no dramatic worth. Is it not strange, too, that Horatio, his stay in his life's great trial, he whom Hamlet wore in his "heart's core, ay, in his heart of heart," has expressed no suspicion of his schoolfellow's madness?

Moreover, to make Hamlet mad would be to violate a dramatic law that Shakespeare himself created and most carefully observes through all his plays, viz., contrast in character. Poor Tom's deceit is the foil to Lear's madness; so, conversely, Ophelia's madness is the foil to Hamlet's feigning. Ophelia is mad in fact, Hamlet but in craft; and to make the madness of both a reality would be to duplicate types—a fault the genius of the great dramatist could not allow him to commit.

In the work of Saxo Grammaticus, the Danish historian from whom Shakespeare derived the materials for his drama, Amleth is represented as taking on madness of violent form in order to avenge his father. This suggestion of the original, supported by the illustrious examples of Brutus and David, Shakespeare took, and the grossness of its form he refined to suit the more sensitive nature of his creation. And lest Hamlet's taking on of madness might excite suspicion by its suddenness, the great master of construction prepares the court for the change, by presenting him weakened by melancholy and loss of exercise, ere yet he has had occasion to resolve on madness. Melancholy indeed he is, but not mad, nor is he thought so by any about him. He is on one of the approaches to the insane state, but no

farther on the way than is necessary to give color to the change when made, and not far enough for the king to connect it with his father's death.

The way being thus on all sides skillfully prepared, the ghost of his father is introduced to Hamlet; and it comes as no shadowy abstraction, motionless in attitude and monotonous in utterance. It is a father speaking to a son of suffering and wrong; but with that tenderness that marked him on the earth, he then melts in pity over the guilty frail one, whom he would leave to the merciful visitation of remorse without additional suffering. It is in pathos that the father speaks; it is in pathos that he is heard by the son. The harrowing tale is told, and Hamlet swears to remember it "while memory holds a seat in this distracted globe."

> "Remember thee!
> Yea, from the table of my memory
> I'll wipe away all trivial fond records,
> All saws of books, all forms, all pressures past,
> That youth and observation copied there;
> And thy commandment all alone shall live
> Within the book and volume of my brain,
> Unmix'd with baser matter: yes, by heaven!"

Hamlet is now wholly and solely vowed to revenge. When Horatio and Marcellus again appear, they seek to know the dread mystery of the ghost, and Hamlet is on the point of gratifying their curiosity, when suddenly he bethinks himself and changes his whole manner.

> "How say you then; would heart of man once think it?
> But you'll be secret,—
> HOR. and MAR.: Ay, by heaven, my lord!
> HAM.: There's ne'er a villain, dwelling in all Denmark,—"

Horatio and Marcellus bend forward to catch the coming secret. Hamlet pauses; then intercepting his original thought, he ends irrelevantly with:

> "But he's an arrant knave";

for the idea has suddenly occurred to him that although Horatio may be trusted with the truth, it is not necessary to include Marcellus. What the latter already knows of his meeting with the

ghost, might, if communicated, excite suspicion of the course he has even now decided to pursue, and lest it should, Hamlet swears him to secrecy and includes Horatio in the oath.

> "Here, as before, never, so help you mercy!
> How strange or odd soe'er I bear myself,—
> As I, perchance, hereafter shall think meet
> To put an antic disposition on—
> That you, at such times seeing me, never shall
> With arms encumber'd thus, or this head-shake,
> Or by pronouncing of some doubtful phrase,
> As, 'Well, we know';—or, 'We could, an if we would';—
> Or, 'If we list to speak';—or, 'There be, an if they might';—
> Or such ambiguous giving out, to note
> That you know aught of me: this not to do,
> So grace and mercy at your most need help you,
> Swear."

Thus in silence and in night, the double secret of his masking and its cause is locked from the king and all the world. Henceforth he is thought mad; until now he has not been considered so. His uncle-father speaks of "Hamlet's transformation"; the Queen, of her "too much changed son." A change has come, and what has wrought it? It was not the terrors of that ghostly night, but the Prince himself that did it by design; and the form of mental ill he chose was that fantastic one that gave him unrestricted liberty of observation and remark. And wherefore did he put the antic disposition on? I answer, out of his weakness and his melancholy. He could not seek the King and kill him at a blow. His relaxed energies failed him at the thought; his sensitive spirit shrank from assassination. Nor could he deal with him through the laws; the usurper was above the courts. "Offence's gilded hand could shove by justice" and "buy out the law."

The incitements to war, intended by the appearance of his father in arms, the insurrection of Laertes, and the expedition of Fortinbras, his nature could not catch; and in his "quick conceiving discontents" he hit on madness as a means whereby he might do and yet not do the deed. Such a stroke chimed, too, with his life's tune. We pity his indecision, but would we not have condemned the blow had he in sudden vengeance dealt it? Had he struck upon the instant and slain the King in open court,

we had not had our lesson—we had not been warned of the evils of indecision, that loses action, love, and life itself.

An evidence that Hamlet was insane before he announced his intention of insanity, is found by some in his treatment of the ghost. He calls him "Truepenny" and "Old Mole," terms applied in the sport of old-time plays, to the devil by the Vice—an extravagant character in a long coat, a cap with a pair of ass's ears, bearing a wooden sword. Shakespeare alludes to this buffoon appearance in "Twelfth Night." *

> "In a trice, like the good old Vice
> Who with his dagger of lath, in his rage and his wrath
> Cries 'Ah! ha!' to the devil."

In the closet scene Hamlet calls his uncle a "Vice of kings," "a king of shreds and patches"; in fact, a harlequin monarch, one who only misrepresents majesty. So when he enjoins the oath of secrecy, and the ghost in his sepulchral tones cries out from below, "Swear," Hamlet takes advantage of these humorous expressions, made familiar by stage custom, and calls him "Truepenny" and "Old Mole," in order to conceal from Marcellus the real nature of the apparition.

At this time, Hamlet has no suspicion that the ghost is other than the "honest ghost" of his father. It was not until later, when resolution palled, that he made shift of doubts to excuse delay in execution. Now he is clear in his office and ready in the conception of his plan. But by whom shall he make the cause of his strangeness appear other than it is; by whom shall he establish belief in his fiction? Ophelia shall do both—Ophelia, that maiden of whom we see so little but for whom we feel so deeply; modest and beautiful, entertaining for the first time love's gentle tyranny. And this very tender passion, in the sternness of his vow, he turns to his account. His love for her must seem the disturbing cause, and her father, the garrulous chamberlain, will be the apt instrument for its dissemination in the court. The harshness of Hamlet's treatment of Ophelia is advanced as a strong proof of his insanity, and his actions indeed seem cruel; but Hamlet has sworn to wipe away from the table of his memory all but the commandment of a dear father mur-

* Act IV.

dered; and the first sacrifice upon the altar of his oath is his heart's best treasure, she for whom his love was greater than that of "forty thousand brothers."

His manly spirit shrinks from the apparent sternness of his course, but he knows that nothing can so effectually veil his design, or throw so real a coloring over the imposture he is to practice. At the first meeting between them at which we are permitted to be present, Hamlet perceives Ophelia at her devotions and speaks kindly to her; but the moving of the arras suddenly reveals to him the "lawful espial," and suspecting the presence of Polonius, he changes his manner and takes on that of a madman. But he fears no loss of Ophelia's affections by the step. Knowing love for her to be the cause, her heart, in pity for his state, will but go out the more to him. And he solaces himself with the hope that the dreadful task once done, they will again unite, their love more pure from the fiery ordeal through which it has passed. The arrival of the players and his testing of their quality, suggest a way of tenting the conscience of the King, and quieting his rising doubts about the true nature and errand of the ghost that spoke to him. The play will tell him all.

The scene in which Hamlet gives his directions to the players is of peculiar interest, not only from its beautiful propriety of judgment and taste in relation to the effects of the histrionic art, but as revealing most distinctly the theory of the great bard himself regarding the true purpose and character of dramatic representation. We read here the whole account of Shakespeare's slight repute as an actor. The style of authorship that preceded Shakespeare's time, and was still lingering on the stage, seems to have abounded in vehement and exaggerated declamation, rant, and bombast. The measured declamation of the player who quotes the description of Priam's death, is representative of the lower tendencies of the popular taste at the time in which Shakespeare wrote. The genuine relish with which he depicts this fustian of the old school and the rant of its favorite stage, cannot escape attention. It is worthy of note, too, that the Hamlet he employs as the whip of the age's folly, is in flesh and blood an Englishman, and no Dane.

The piteous disclosure of Ophelia's insanity reveals the tragic issues to which the whole conduct of the play is tending. The deeply touching character of this real display of mental ill, is undoubtedly a device of the poet to contrast the truth with the fiction of madness. Hamlet's conduct at the grave of Ophelia has been erroneously considered as a manifestation of want of feeling, and as a plain indication of insanity. Indeed, his conduct may be adduced as an argument of his deep-seated passion for Ophelia, and as directly against his insanity.

The maimed rites of the church have consigned to the earth her whose tender mold was all unfitted to bear the ills of life. Laertes, in his impulsive and reckless manner, leaps into the grave of his sister and invokes the gods to pile mountains on the quick and dead. What can be plainer than the language with which Hamlet rebukes the exaggerated expressions of the brother's grief, and asserts his own love?

> **"I lov'd Ophelia; forty thousand brothers**
> **Could not, with all their quantity of love,**
> **Make up my sum."**

This, with what follows in the scene, is the outpouring of the long pent-up torrent. Nature at last gives way, and the agonized heart of the Prince finds vent in that burst of violent passion in which love, rage, and wildness are blended, until, overcome with his emotions, and the conviction that he has betrayed his secret, he rushes from the scene, giving utterance to one of those strange exclamations of mingled sense and incoherency by which he seeks to restore belief in his insanity. This is the last outburst of violence; when he next appears, how tranquil, how subdued has he become. The pall of the coming catastrophe has thrown its shadow over him, and he seems like one just awakened from a terrible dream.

Osric enters, and delivers the challenge to the trial of skill with the foils. It is accepted, and, in reply to Horatio, who says, "You will lose this wager, my lord," Hamlet replies:

> **"I do not think so; since he went into France, I have been in continual practice; I shall win at the odds. But thou wouldst not think, how ill all's here about my heart; but it is no matter.**

HORATIO: If your mind dislike anything, obey it. I will forestall their repair hither, and say, you are not fit.

HAMLET: Not a whit, we defy augury; there's a special providence in the fall of a sparrow. If it be now, 'tis not to come; if it be not to come, it will be now; if it be not now, yet it will come: the readiness is all: since no man knows aught of what he leaves, what is 't to leave betimes? Let be."

What more has he to live for? Self-condemned, he shrinks from the wearisome burden of life and all its fearful responsibilities; he longs to "leave betimes."

The last scene opens with the King, Queen, and assembled court. The trial of skill begins. Hamlet is hit by Laertes with the poisoned foil. They close and struggle. Hamlet seizes the fatal weapon, and wrenching it from the hands of Laertes, runs him through the body. He falls, crying out:

"Hamlet, thou art slain;
No medicine in the world can do thee good,
In thee there is not half an hour of life;
The treacherous instrument is in thy hand,
Unbated, and envenomed:
. . . . . .
I can no more;—the King,—the King's to blame.

HAMLET: "The point envenom'd too!
Then, venom, to thy work!"

He dashes the king's sword from his hand, and stabs him to the heart. Thus is the ghost avenged by an accident, and thus are Hamlet's own words verified:

"Let us know, our indiscretion sometimes serves us well,
When our deep plots do pall."

What can be more conclusive evidence of sanity (though vexed by mental complexities and physical perturbation) than Hamlet's words to Horatio, to set him right in the eyes of the world—to tell his story; how he was enjoined, by the dread visitation of his father's ghost, to avenge his murder; how he had put on the antic disposition to cover his real designs; how he had slain Polonius by mistake and driven his daughter to frenzy and death; the queen poisoned, Laertes dead, and his own death closing the eventful history.

"O, good Horatio, what a wounded name,
Things standing thus unknown, shall leave behind me?

If thou didst ever hold me in thy heart,
Absent thee from felicity awhile,
And in this harsh world draw thy breath in pain,
To tell my story."

This is the legacy he bequeathed to his bosom friend. His generous spirit shrank at the possibility that doubt and uncertainty would rest on his motives and actions. He could not die until he was assured that justice would be done his name; that the people would know his wrongs, and his struggles to redress them; that they would sympathize with the sufferings of a loving son, contending with the dread command of a murdered father, and the promptings of a soul deeply imbued with philosophy, humanity, and the sacred principles of eternal truth.

As the curtain falls on the sad spectacle of human frailty, what feeling heart, as it throbs with sympathetic pity, will forbear to re-echo the beautiful tribute paid by Horatio to his sorely-tried friend and fellow student:

"Now cracks a noble heart. Good-night, sweet prince;
And flights of angels sing thee to thy rest!"

JAMES E. MURDOCH.

OBSTACLES TO CIVIL-SERVICE REFORM.

THE principal object of this article is to set in as clear a light as possible some of the obstacles which stand in the way of civil-service reform; incidentally it will show how those obstacles are to be overcome. The morality, the expediency, and the necessity of that reform we shall, for the most part, assume. Our purpose is not to persuade its opponents, but to assist its friends. Neither do we attempt to lay down any plan of campaign. Let us first see clearly what we have to do; the methods of doing it are matters for subsequent consideration. By civil-service reform we do not understand merely the honest enforcement of the present civil-service act. The operation of that act is, by its own provisions, of very limited extent. It applies to the "classified civil service" only, and that includes less than one eighth of the offices at the disposal of the national government. There is another very small portion of the public offices, varying in number according to the condition of political affairs, which any administration, in order to carry out its policy successfully, will find it necessary to fill with its political friends. But, instead of one eighth, at least five sixths of the offices in the national government should be filled and held in entire independence of party considerations. So long as politicians habitually regard sixty thousand post offices and a not much smaller number of other offices as legitimate party plunder, they will look upon evasions of the civil-service act as worthy of censure only when performed so bunglingly as to be detected by the opposite party. In civil-service reform we must get the whole before we can have much assurance of keeping a part. Hitherto the support given to the civil-service act has been, to a great extent, cowardly and fraudulent—cowardly, because members of Congress who posed as its friends have neglected or refused to supply the means which they knew were necessary to carry it out; fraudulent, be-

cause those who pretended to be enforcing it were all the while contriving how to evade its provisions.

Genuine civil-service reform is based upon a single fact, and aims at carrying into effect a single principle. The fact is this: seven eighths, perhaps more, of the persons who are engaged in transacting the business and executing the laws of the United States, are discharging duties which, when properly performed, are performed in precisely the same manner, whether they themselves or those with whom they have to deal are Republicans or Democrats or of any other political party. If a clerk in the custom house does his duty as he ought to do it, no one will ever ascertain whether he believes in protection or free trade by watching how he turns marks into dollars or poods into pounds. If a postmaster performs his duties with the promptness, courtesy, and impartiality which he is legally and morally bound to exercise, no one, by observing how he receives and delivers letters and papers, will ever find out his opinions, or the opinions of those who call at his office, on the propriety of paying subsidies to the owners of steamships or the expediency of establishing postal telegraphs.

The principle of the reformers is this: where the political opinions and affiliations of the holder of an office can rightfully in no way affect his discharge of its duties, his appointment to the office, or his tenure of it, should likewise in no way be affected by them. Mr. Cleveland formulated the principle in the sentence, "Public office is a public trust." The most inveterate spoilsman might assent to this formula if he were allowed to put his own interpretation upon it. But friends and foes alike interpreted it, and believed that Mr. Cleveland intended it to be interpreted, as meaning that the trust should be committed to the best attainable trustee, irrespective of party considerations, and executed by him until the public interests, also irrespective of party considerations, should require its withdrawal and its commission to another.

The principle of the spoils system was formulated during the administration of Andrew Jackson, by the adoption and interpretation of an ancient maxim, "To the victors belong the spoils"; "victors" being interpreted to mean the successful party, and

"spoils" the public offices. But the doctrine can be formulated and interpreted in a manner more consonant with its actual application, and better fitted, by its identity in form, to emphasize its contrast in meaning with Mr. Cleveland's declaration. That form is "Public office is a party prize"; and the interpretation of the maxim so expressed is that the prize should be awarded to him who will contribute most to the continued success of the party and faction, and especially to the political fortunes of the person by whom the prize is conferred. To the reformers this doctrine seems morally wicked and logically absurd. By their discussions of the doctrine they have undoubtedly done much to expose its immorality and absurdity; but we think they have greatly underestimated the strength, and often misconceived the nature, of the hold it has upon the thoughts, the habits, and the political life of the masses of the people.

The adoption of the principle that public office is a party prize, was apparently sanctioned by the second election of Jackson. It was one of those cases which are constantly occurring under a democratic form of government, where, for all practical purposes, acquiescence is equivalent to approval. For a time the protests of the opposition were frequent and earnest. They grew fainter under Van Buren. Their last echoes were drowned in the roar of the hard-cider spree of 1840. The elder Harrison was inaugurated in the midst of a vast mob of office-seekers, hoarse with vociferous demands that the spoils should be divided, and that too with a celerity that was physically impossible.

The application of the spoils principle was taken as a matter of course until, under the administration of Gen. Grant, its abuses had become so rank that, by the act of 1871, the President was authorized to make a limited experiment in reform. But the subsequent action, or rather lack of action, on the part of Congress, showed that the authorization was as dishonest as it was limited. The requisite machinery to carry out the provisions of the act was hardly organized and put in motion before the President was obliged to call a halt. The means for making the experiment were exhausted, and Congress neglected to make further provision. In 1879, President Hayes, in view of the coming election, made a faint pretense of renewing the experi-

ment. It had no practical results. The disasters which overwhelmed the Republican Party in 1882, rather than any real desire for civil-service reform, led to the passage, in January, 1883, of the statute known as the Civil-service Act. It is not necessary now to enter into any detailed examination of the way in which that statute has been executed.

The passage of the act has always been regarded by the reformers as a great triumph. We cannot help thinking they have somewhat exaggerated its importance and, to some extent, mistaken its effect upon the minds of the common people. It inserted the thin edge of the wedge of reform into the rotten mass of the spoils system, but the reformers have since somewhat relaxed their efforts to drive the wedge home. Wherever the law has been faithfully executed, it has more than fulfilled the expectations of its supporters. It was faithfully executed by Mr. Burt in the Naval Office in New York; and the duties of that office were never discharged in a manner so creditable to the government or so satisfactory to the people. It was faithfully executed by Mr. Pearson in the New York Post Office; and, in spite of difficulties which seemed to be thrown in his way for the mere purpose of embarrassing him, that vast machine became one of the model offices of the world. The reformers have been able to point to these and other notable examples as proofs of the practicability and expediency of the law, and for this we should be thankful. On the other hand, no law of so much public importance, and yet so limited in its range, has been so often evaded and so impudently violated. The stock argument of the opponents of the reformed system has always been that it is impracticable, and they have pointed to these violations and evasions as the proof. The effect of these arguments upon the public mind has, for reasons which we will presently state, been much greater than is generally supposed.

And now what indications of the progress of civil-service reform are afforded by the first year of the present administration, the seventh year of the operation of the Civil-service Act? On the 4th of March, 1889, Gen. Harrison was inaugurated, amid a throng of office-seekers compared to which every preceding crowd, assembled on a similar occasion, was, in numbers, but as

the congregation of an up-town church compared to a Tammany mass meeting in Union Square. Washington was filled with a vast multitude, who dined in restaurants and slept on cots in halls. Whatever may have been the intentions and wishes of the President, he was swept on by the resistless flood of his own party. So far as the provisions of the Civil-service Act extended, he carried them out in a manner that met the approval of reformers. But that act applied to only one eighth of the civil service. To the other seven eighths the application of the spoils system was demanded by all the influential men with whom he came in contact. The work of removal and appointment was immediately commenced, and has been prosecuted with relentless energy. The reformers stood amazed at the extent, and dazed by the rapidity, of the work. The ears of the President were deafened by the reproaches of an anxious and eager crowd, complaining of the slowness with which their wishes were gratified. They seemed to think that time and numbers imposed no limits on official action. The work is still going on. Probably before the end of another year the axe will cease to fall, not because its edge is dulled or the arms that wield it are weary, but because there are no more heads to lay upon the block. The triumph of the spoils system seems to be complete. But let the reformers take courage; possibly this is the last flurry of the whale.

One of the worst features of the experience through which we are now passing is that it indicates, on the part of politicians, the wide diffusion and rapid increase of a belief that the keeping of promises is no longer an article in the code of political ethics. Declarations of principles, pledges as to future action, are, at each succeeding election, more and more regarded, both by the candidates who make them and by the voters to whom they are made, as mere matters of form, parts of the ordinary campaign machinery, things to be cast aside without scruple because nobody took them in earnest. Words have been misused until they have lost their meaning. No forms of phraseology are left which will impress the popular mind with a conviction of their sincerity. The pledges of fidelity to the principles of civil-service reform contained in the platforms of political conventions and in the speeches of political orators, have exhausted the resources of

the English language. The sheets on which the pledges were printed have long ago been used to kindle fires, and the pledges have gone up in the smoke. At the protests of the reformers the politicians laugh They say the reformers know nothing of practical politics, are mere theorists and *doctrinaires*. For reasons that we will now endeavor to make clear, we fear the great majority of the people still agree with the politicians.

From the second election of Jackson, in 1832, down to the present time, the doctrine that "public office is a party prize" has been the controlling factor in the administration of the national government. The limited and imperfectly-executed Civil-service Act, so far as its effect on the great body of the common people is concerned, constitutes no exception. Every boy of fifteen who hurrahed, because his father voted, for Jackson in 1832, had, if alive at the election in 1888, passed the age of three score and ten. Every voter who cast a ballot in 1832 and lived to cast one in 1888, was then seventy-seven or more years old. Even among this little band of aged men the administration of government upon any other plan was but a dim reminiscence of boyhood. Practically they were in the same condition as their younger fellow citizens. The people of the United States, then, have no practical knowledge of any other method of administering government. The spoils system is like one of those customs which the common law declares equivalent to a statute, "a custom so old that the memory of man runneth not to the contrary." It is a part of the unwritten law, an unexpressed but understood provision of the Constitution. It is interwoven with all their modes of political thought; it intermingles with all their motives of political action.

The number of those who profit by the system is very great, but compared with the number of those who hope to profit, it is but as the number of shells compared with that of the grains of sand upon the sea shore. Those who neither profit nor hope to profit by it, accept it as something in the natural order of things. Whenever the result of a presidential election has settled the fact that after four months the party in opposition will become the party in power, the next topic of speculation and conversation is who will get this place and who will get that. In every

hamlet, at every cross-roads, each man asks his neighbor: How long will it be after the new president comes in before the old postmaster goes out? That the latter event should follow the former has always been the customary sequence. The people remember no other system; they doubt whether any other would work. To overthrow a system so fortified by age, by custom and by interest, is a great undertaking. It can be accomplished only by unflagging efforts to awaken the people to a full consciousness of the evils to which they have been accustomed for more than two generations.

The next point to which we wish to call the attention of reformers, is that hitherto they have paid too much attention to appointments, too little to removals. The method of appointment by competitive examination provided by the Civil-service Act for the "classified civil service," is inapplicable to the great bulk of the "unclassified civil service," which constitutes about seven eighths of the whole. If the exercise of the power of removal could be restricted within proper limits, the manner of appointing officers would, to a great extent, become a matter of indifference. Under a properly-organized system, vacancies in offices of a purely administrative character would be caused only by death, by physical, mental, or moral incapacity, by voluntary resignation, or by limitation of law. The operation of these causes would be very gradual. When a change should take place from one party to another in the administration of the government, there would be few if any more "places" to be distributed among "heelers" and "henchmen" and "workers" at that time than at any other. A promise of a postmastership by a "boss" who could make no pretense of being able to remove the incumbent, would hardly induce any one to increase his contribution to the "campaign fund." The opportunity of fulfilling the promise might never come; at any rate the time of fulfillment would be so indefinite that the promise would have little influence on anybody's political action.

What limitations should be placed upon the power of removal, we cannot now attempt to discuss. The problem is very difficult, but until some method is devised which shall render impossible the "clean sweep" that follows every change in the

relative position of parties, we shall have no genuine civil-service reform. The very evils which the spoils system creates tend to perpetuate its existence. They act like gravity on a pendulum, pulling it down on one side, but in the very act generating a velocity which carries it up on the other. We will endeavor to analyze some of the causes which tend to perpetuate the system. When a party which has been in the minority, especially if it has been for a long time in the minority, comes into power, flushed with victory and supported by the verdict of the people just rendered in its favor, what is the condition of affairs that it encounters? Every office is occupied by a person, not of opposite political opinions merely, but a "worker," who considers the discharge of his official duties a matter of subordinate importance. The purpose to the accomplishment of which his time and his thoughts and a considerable portion of his means are principally directed, is the skillful supervision of his allotted part of a great machine that has nothing to do with his office. The office-holders are the men who manage caucuses, appoint committees, run conventions. They are smarting under their recent defeat, and are enraged because the large percentage of their salaries which they have contributed to the campaign fund has been spent in vain.

Under such circumstances, the newly-elected president will find himself assailed by a large portion of the influential men of his own party, with arguments and importunities which he will find it difficult to withstand. They will urge, and truthfully urge, that the only reason why the present officers were appointed, was that they were expected to labor for the perpetuation of the policy which the people have just condemned; that the only reason why their predecessors were removed, was that they supported the policy which the people have just approved. They will argue that reform does not mean that when we are in power we should keep in all our enemies, and when our opponents are in power that they should turn out all our friends. For years, nearly one half of the people of the United States, it will be urged, have been proscribed. The proscribed have now become the majority. Let them try their hand. With these and other arguments Mr. Cleveland was assailed immediately after his ac-

cession to the presidency and throughout his administration. If he did not satisfy all the expectations of reformers, the wonder is, not that he accomplished so little, but that he accomplished anything at all. It will thus be seen that the clean sweep of one party becomes the excuse, and to a certain extent creates the necessity, for the clean sweep of the other party. That is one of the miseries of the miserable system. After a party coming into power has made its clean sweep, after it has filled all the offices with strong partisans or the *protégés* of strong partisans from its own ranks, it naturally begins to see the evils of the spoils system and to talk of reform. It has all it can get; its chief object now is to keep what it has. It begins to see the desirability of restricting a power which it has already used to its utmost extent. There are no more spoils to be distributed, except in those rare cases which arise in a service where "few die and none resign." The leaders have gained all they can hope for by change, and they begin to talk of the advantages of permanence. The present political situation affords one striking example of this "change of heart." During the past year the removal of old postmasters and the appointment of new ones have gone on with a rapidity so amazing that few who had not seen it would have believed it possible. A few months more of equally relentless energy, and there will not be a democratic postmaster in the United States, except here and there one whose retention is due to some personal reason on the part of the politician in whose hands the appointment lies. Hence a bill has already been introduced in Congress to place the post-office spoils beyond the reach of the opposite party, should it come into power.

The permanence of any such legislation is very doubtful. No matter how expedient and just the new system might be if it went into operation under proper conditions, it would be impossible to convince a victorious party that one of the proper conditions is the possession of all the offices by the defeated party. A victorious party will not wait, and the sentiment of "fair play" among the masses of the common people will excuse it for not waiting, to see that approximate equality in the distribution of offices between the political parties, which would naturally

and inevitably result from the operation of a just system of removals and appointments.

Under a properly-organized system, the vacancies created by the action of legitimate causes would be filled sometimes by the adherents of one party, sometimes by those of the other. The majority of the new appointments would go to the respectable middle classes. The idle, the ignorant, the depraved would not seek them, because they would be conscious of their inability to endure the tests of fitness. The wealthy would not seek them, because the remuneration would not compensate them for the expenditure of time. The highly-educated would not seek them, because they would hope for success, or would have already achieved success, in other careers. The number of ardent politicians would be no greater, in proportion to the whole number, among office-holders, than it is among carpenters, or bookkeepers, or school teachers. But the reformed system will never be successfully started with all the offices in the hands of one party; and the work of removal once commenced, it will always be difficult to prevent its becoming a clean sweep.

The problem which the reformers have to solve is a very difficult one. They must first bring about something like an approximation to equality in the distribution of the offices between the political parties, which would be the ultimate result of the reformed system itself. They must do a part of their work before they have their tools. Above all, they must devise some means to restrain, either through the force of public opinion or through law, that wholesale system of indiscriminate removal which, for two generations, has gone on corrupting the political morality of the masses, turning their attention from the examination of principles to the contrivance of methods for getting a share of the public plunder—a system ever diminishing the influence of the patriot and the statesman, ever increasing that of the "worker" and the "boss."

WALTER M. FERRISS.

THE WAGES SYSTEM.

THAT we are approaching an industrial revolution may not be true; that one is promised or threatened cannot be doubted. The discontent with the existing social order is deep, widespread, and extraordinary. It characterizes in different degrees nearly all classes, all faiths, and all commercial and industrial communities. Anarchic movements, strikes, labor unions, socialistic conventions are by no means the only indications of the industrial discontent and unrest. These are serious in their proportions, and in some instances almost revolutionary in their results. The great railroad strike in the North-west a year ago disorganized the traffic of a large section of the country and threatened the domestic commerce of the entire nation. The coal-miners' strike in the East advanced the price of coal and for a time closed many factories. The dock laborers' strike in London paralyzed the commerce of Great Britain while it lasted, and the analogous strike in Liverpool resulted in the withdrawal from the ocean of several of the regular passenger steamers. A large proportion of these strikes—larger than the public generally imagine—are in whole or in part successful. One of the recent reports of the Labor Commission of the State of New York shows that a considerable majority of the strikes in that State resulted in a victory partial or complete for the strikers.

The discontent is by no means confined to the lower classes of laborers. Every skilled trade has its union; and a number of these unions are united in a Federation of Labor, which itself is not the less a sign of the times that it has hitherto been dominated by conservative and pacific counsels. The farmers, always a conservative and generally a contented portion of the community, are beginning to show unmistakable indications of a spirit of revolt against the existing order. The Roman Catholic bishop of Kansas declares that they are the least protected members of the community, and recommends their organization

for the purposes of self-defense. Interest accounts eat up their profits and gradually devour their farms, which are apparently beginning to pass from the hands of the cultivators of the soil into those of absentee landlords. To the farmer it makes small difference whether he is the nominal owner and pays eight per cent. interest to a mortgagee, or is a tenant and pays the equivalent in rental. Indeed, some years ago a prosperous English farmer assured me that he found it practically better to pay rent to a landlord than interest to a money-lender.

The press, in spite of the fact that it is owned and controlled by large capitalists, is beginning to reflect the general demand for social and industrial reform. The great daily newspapers are better as reporters of the current life, than as interpreters of its significance or prophets of its tendencies; but the great dailies are beginning to demand, with a voice which the deaf can hardly fail to hear, attention to the evils and the necessary evils of the present industrial system. Bellamy's vision of an industrial millennium, which twenty-five years ago could not have found a publisher, now reaches a sale of a third of a million, and is apparently going on to half a million. A magazine devoted wholly to the advocacy of Nationalism leaps at once into apparent success; two other periodicals published in the interest of industrial reforms scarcely less revolutionary have a constituency respectable both in quality and quantity. In addition to these, there are various labor journals, organs of special movements, whose aggregate circulation is far from insignificant as an indication of public sentiment. The preacher who announces as his subject some phase of industrialism is sure of a full house; and if he has anything better than platitudes to utter, will be listened to attentively evening after evening. In Germany the Emperor summons an international labor conference; he recognizes the evidences of socialistic sympathy in the army, on which he can therefore no longer depend to repress industrial discontent, and accepts the resignation of the statesman who has been for many years the real monarch of Germany, apparently because he reads in the last elections the demonstration that Bismarck's repressive policy can no longer be safely relied on to preserve the peace of Germany. These signs of the times are writ so large

that the dull of sight can hardly fail to see them; these voices of prophecy are so loud that only the deliberately deaf can fail to hear. There is scarcely a trade of any description to-day, which involves the employment of any considerable number of men, the directors of which do not have to take account of this feverish condition of our social and industrial life, in their industrial plans and purposes.

It can hardly be doubted by any careful and candid student of human affairs that this discontent has a common cause, and seeks, though blindly and unintelligently, a common result. It is not a series of fragmentary and spasmodic discontents; it is a deep, widespread, and common discontent, one in its origin, one in its essential demands. The striking operatives do not wish merely to get higher wages or shorter hours; the complaining farmers do not wish merely to get lower freights and lower interest rates; these demands are the immediate occasion, not the primary cause of this present ferment and prospective uprising. It is not merely by a series of unlucky chances that the railroad men of Iowa, the coal-miners of Pennsylvania, the dock laborers of London, and the artisans of Germany almost simultaneously present claims that are almost identical. The secret cause of discontent, the half-understood desire for change, is in its essence the same in Berlin, in London, in New York, in Chicago; in the artisan, the coal-miner, the brakeman, and the farmer. Whether they know it or not, it is a demand which nothing less than revolution will satisfy. Socialism is "in the air." And Socialism is revolution —a more radical revolution than some of those who are leading it imagine. Mr. Kirkup, the certainly not anti-socialistic contributor of the article on Socialism in the "Encyclopædia Britannica," correctly indicates the profound significance of this movement when he says:

> "Socialism implies and carries with it a change in the political, ethical, technical, and artistic arrangements and institutions of society, which would constitute a revolution greater probably than has ever taken place in human history—greater than the transition from the ancient to the mediæval world, or from the latter to the existing order of society."

If we are on the eve of any such revolution as this, it behooves us to look about us and beneath us; to study this rising current;

and to see, if we can, whither it will bear us, and how, if at all, it can be guided to a prosperous issue.

And in some respects the student is better fitted to fulfill this function than the man of affairs. He does not indeed understand the labor problem in detail as well as the merchant, the manufacturer, or the railroad-manager; but for this very reason he is better able to perceive the origin and trace the probable course of the great public currents. The man who is in the midst of the waves battling for his life, cannot as well comprehend whither the waves are bearing him, as he who is safe upon the deck, and sees both the ocean and the swimmer from his vantage ground. The man of the counting room, if he is not blinded by his own self-interest, can tell what is practicable to-day or to-morrow better than the student, who is always liable to fail in his attempt to apply general principles, because he is ignorant of those "circumstances that alter cases"; but the student can better elucidate the general principles whose application can alone eventually bring order out of chaos, both because he is not blinded by self-interest, and because he is not confused by the turmoil in the midst of which the man of the counting room lives. If the knowledge of the one is more accurate and detailed, the perspective of the other is truer and his horizon larger. The ancient Hebrew prophetic office has not been abolished. It may seem somewhat egotistical for any man to assume the function; yet if Providence has made him, perhaps in his own despite, a public teacher, he must not hesitate to study current life, or fear to give his interpretation of it. The true teacher, the teacher who is to serve his day and generation, cannot be true to himself, his country, or his God, if he content himself with merely repeating the general lessons of justice and truth which the world has already learned and which he finds recorded in text books. He must at least attempt, as God gives him opportunity, to do what the ancient prophets did—study the movements of his time, and understand as best he may their divine significance; he must use the leisure which freedom from the details of purely industrial work affords him, to investigate the origin, the significance, and the possible issue of the great intellectual and social movements of his own time, and give to his fellow men the results of his investigation

and reflection, without fear of opprobrium on the one hand, and without dogmatic self-assertion on the other.

In the first stage of the world's development, capital owned labor. This was slavery. The laborer was a part of the world's capital; the rich owned the poor. That was succeeded by feudalism. In this system the rich owned the land; the working men were attached to and formed a part of it. They were a kind of living real estate. The capitalist owed them protection; they owed him fealty, obedience, allegiance, and a large share of the product of their industry.

This stage has given way, in turn (after a brief term of industrial individualism), to a third, the wages system. Under the wages system the capitalist no longer owns the laborer; slavery is abolished. The capitalist no longer has a lien upon the laborer; feudalism is abolished. But the capitalist owns substantially all the tools and implements of industry, and the laborer employs them in productive work. The two classes under this system are mutually dependent. The owner of the tools cannot get any product out of them unless he can find laborers who are willing to work with them; but the laborer, however willing he may be to work, can have no opportunity unless he can find some tool-owner willing to allow him the use of the necessary tools. In my boyhood the New England farmer fatted, killed, and dressed his own hogs; now the butchers of Chicago stand in line waiting for the pork-packers of Chicago to determine who of them may have an opportunity to earn his daily bread by killing hogs at the rate of five or six a minute. Our meat is certainly cheaper, perhaps better; the advantages are great—so great that we shall never go back to the old system of individual industry. But the new system has this characteristic, that one set of men, few in number, own all the tools, and another set of men, large in number, are dependent upon these tool-owners for an opportunity to use the tools, and therefore to engage in productive industry.

The progress of the last hundred years or more has been steadily in this direction. The number of tool-owners has diminished; the number of wage-earners has increased. The shoe factory crowds out of existence the cobbler in his stall. The

sewing machine turns the tailor into a unit in the great shop. The wife no longer spins the carded wool at her own fireside; the spinning jenny does her work for her. The printing press, owned by a single capitalist and employing a hundred or five hundred hands, does a myriad times the work which the copyist could do before the days of Gutenberg; but the copyist owned his pen and vellum, and the type-setter does not own his font. The stage-driver was often part owner of the stage he drove; the locomotive engineer drives another man's vehicle. In the great West, bonanza farms owned by non-resident capitalists and operated by impecunious laborers paid by the day or the week, are threatening to take the place of farms worked by the owner of the soil, or remain in the hands of the farmer only because he pays rent for them in the form of a heavy mortgage interest. Steam applied to locomotion has increased beyond all past imagination or present calculation the facilities for travel; but it has made the highways of the nation private property, and given the control of them to a few great capitalists. Even the lightning becomes private property. The nerves of the nation which flash its thought across a continent, and the arteries of the nation through which its life blood circulates, are personal property of individual owners, who determine for us on what terms ourselves, our goods, or even our thoughts shall be transported from one part of our empire to another.

It is not necessary for me to trace here the process by which organized labor has taken the place of individualized labor, and the wages system has supplanted individualism as individualism supplanted feudalism. The application of steam as a motor force has changed the nature of the world's tools and has necessitated organization in industry. Education has rendered it possible. Facility of movement, both for men and for goods, has united in promoting it. The economic advantages to the community have been beyond all measurement. The steady growth of the doctrine of human rights, which first destroyed slavery, man's ownership of men, has also destroyed feudalism, man's lordship over men. Carlyle and Ruskin sigh in vain for the good old times. The rattle and clang of the cotton mill will never give place to the musical whirr of the home spinning

wheel, nor the rumble and shriek of the train to the roll of the stage coach and the horn of the guard. The good days lie in the future, not in the past.

For that the wages system is a great advance over the system of feudalism, as feudalism was a great advance over slavery, admits of no questioning; that the rich have grown richer and the poor poorer under this system has been often asserted but never demonstrated. The sun never looked upon so many abodes of comfort as he looks upon to-day. America, where the wages system has reached, let us hope, its culmination, where certainly the least trace of feudalism is to be seen, is the country where the workingman has not only the most independence but the largest wealth. But were it otherwise, it would still be true that the wages system, with all its drawbacks and demerits, is an advance on feudalism, as feudalism is an advance on slavery. No working man worthy of the name would be willing to go back to a position of subserviency to a feudal lord, as none would be willing to go back to the unmanly ease of slavery. The wages system has delivered the working man from patronage, and given him freedom; and no man who is a man would be willing to exchange freedom for patronage. The cares and anxieties of liberty are a better inheritance than the careless and reckless joyousness of servitude.

Nevertheless, the wages system is not the industrial ideal. It is not the end. It is itself a step toward something better, as slavery was a step toward feudalism, and feudalism a step toward capitalism. Slave-owners were often Christian men, but their personal goodness could not redeem a system which was itself radically and incurably bad. As the curse of slavery was not an occasional Legree, so it could not be cured by an occasional Dabney. Feudal lords were often chivalric and noble men who dared and suffered and died for their subject tenants, but their personal chivalry could not redeem a system which was at best only a transition from something worse to something somewhat better. Many of our capitalists are men of noblest purposes. They are not tyrannical, despotic, greedy. They have given their lives, their hands, their heads to their country. They have been themselves America's hardest-working men. They have

tossed uneasily on hair mattresses many a night while their workingmen slept unbroken sleep on beds of straw. They have pushed away the untasted delicacy at the breakfast table while their workingmen ate with hearty appetite a less luxurious meal. They have fought bankruptcy for the sake of the men dependent on them, and with nervous susceptibility which muscle can never comprehend, have suffered vicariously in apprehension all the pangs of poverty of those whom they were, in vain perhaps, endeavoring to supply with work and so with bread. When they have succeeded, the community has always had the greater share in the success. They have founded our hospitals, built our churches, established our libraries, erected our schools and colleges. Even when they have not been benevolent, they have been beneficent. Whether they would or no, their activity and energy have been a benefaction to the community. The railroad magnate lives in a finer house, drives a finer horse, wears a finer broadcloth, and eats a tenderer steak than the wage-earner who works for him; but when he has lavished all he can upon himself, he has expended but the smallest part of the wealth his brain has conjured up. The rest goes into railroads which open wild country, convert the wilderness into farms, and the hunting grounds of yesterday into the gardens of to-day. The steel rail he lays is an enchanter's wand, and where it enters a community of homes and a long line of villages spring up as if by magic, and a ceaseless chime of church and schoolhouse bells ring in the advent of a blessed civilization.

The working men, says Chauncey M. Depew, have a grievance; it exists. What is it? Their indictment is not against capitalists, it is against capitalism. It is not against men who have often, if not always, done what they could to lessen the injurious effects of a rigorous system, and to ameliorate the condition of those who suffer from it; it is against the system itself. They indict it as a system which impoverishes the poor, bankrupts the many, and aggrandizes without benefiting the few. If we would understand the universal discontent of the present quarter-century, we must understand what, in its essential features, the wages system is. We must put ourselves in the place of the wage-earners, and comprehend the conditions of life against

which they protest. We must endeavor to interpret that protest, not by asking them what they desire, but by studying life and ascertaining from it their real want and interpreting that want to them.

By the wages system, then, is meant, not merely a system that pays wages, but that system which leaves all the tools and implements of industry in the hands of a few men, and depends for their use in productive industry upon the toil of the many; which makes a few men own the railroad while the many work it, a few men own the factory while the many operate it, a few men own the soil while the many till it; which treats the laborer as a commodity to be hired in the cheapest market, and dependent for his use of his power to provide for himself and his household on the wisdom and the will of the capitalist—his wisdom to find employment for the many, and his will to give it to them; which divides society into two great classes, with a deep if not broad gulf between them—on the one side tool-owners, who are employers, on the other side workers, who are employed. A great deal of the current discussion assumes that this is a necessary system; that its defects can be corrected and the evils which grow out of it ameliorated, but that the system itself can never be changed; that employers can treat their workmen with justice and even consideration, and workingmen can treat their employers with fidelity and honesty, but that while the world stands there must always be these two great classes of tool-owners and workers; that it always has been and always must be to the end of time. In truth, however, this system is modern, chiefly the product of the present century; and if the world moves as rapidly for the next twenty years as it has for the last twenty, it may possibly not reach beyond the first quarter of the twentieth century.

In the few pages which remain to me in this article, I desire to act simply as a reporter; to present, in their name and in their behalf, the wage-earners' indictment of this system, to the readers of the FORUM, who seldom hear the voice of the wage-earner himself; to do this without weighing and measuring each count in this indictment, or adjudging between the accuser and the accused. These counts seem to me one-sided, as counts in an

indictment always are, and sometimes perhaps overstrained, as counts in an indictment are apt to be; but they are not the passionate appeals of Ishmaelites whose hands are against every man, nor the loud-mouthed utterances of demagogues whose tongue is their only capital. They are sober, serious, well-considered charges, not against capitalists but against capitalism, as they may be gathered from the pages of the more thoughtful students of the existing system, who have studied it from the point of view, if not as the advocate, of the wage-earner. Here, then, is the wage-earners' indictment of the wages system.

Every man has a right, because he has a duty, to earn his daily bread by the sweat of his brow. The wages system denies this right to myriads of willing workers. In America, the working man's Eldorado, nearly 1,000,000 willing workers were thrown out of employment in 1885. "Enforced idleness," says Carlyle, "is the Englishman's hell." That system cannot be right which turns 1,000,000 willing workers in rich America into this hell and locks the door against them. Every man has a right to the product of his own industry; under the wages system the greater part of the products of industry go into the hands of the few tool-owners. The wealth of this country has increased during the past quarter-century from fourteen billion to forty-four billion. A careful statistician estimates that the wages of 5,200,000 unskilled laborers were in 1884 less than $200 a year, while the average wages of workmen engaged in manufactures, including skilled laborers, was but $346 a year. That system cannot be right which gives the profits of industry to the few and compels the many to live always praying, Give us this day our daily bread.

Four gifts God has given to all his children to possess in freedom—air, water, sunlight, land. The wages system, concentrating the land in the hands of a few tool-owners, crowds the many in tenements where sunlight is darkened, water is poisoned, and air is pestilential. "The mean mortality," says Elisé Reclus, "among the well-to-do, is at the utmost one in sixty. Now the population of Europe being a third of a thousand million, the rate of mortality among the fortunate should not exceed five

million. It is three times five million." That system cannot be right which denies to God's children God's free gifts, and so summons death to their doors thrice as often as else he would come. Modern machinery, Mr. Atkinson tells us, enables seven men to feed a thousand. This ought to leave some leisure for self-development to the hand workers. What time had the car-drivers who stood on their feet fourteen to sixteen hours a day? Or the bakers who, until recently, worked twelve to eighteen? What time have the iron-workers of Pennsylvania who toil twelve hours in the day, 365 days in the year? That system cannot be right which, though God's beneficent forces stand ready to do the world's drudgery, leaves so many men mere drudges. Uncounted mothers who have a right to be home-stayers, are denied that right by the wages system, and are driven to the factory with the husbands whose incomes cannot support homes; unnumbered children under this system stand with weary eyes and pale faces beside their fathers, or in their places, in the great army of factory operatives.

The system is indicted in the name of capitalist as well as of working man—indicted because it produces, strengthens, develops that plutocracy which the prophet De Tocqueville declares to be the most dangerous enemy of republican institutions in America. It is indicted in the name of political economy, which demands of any permanent industrial system that it shall produce, not only wealth, but an equable and just distribution of wealth. It is indicted in the name of a free republic, which it threatens by its money rings and its corruption frauds; by its purchase of public servants without dissembling and in the open market. It is indicted in the name of society, because it converts legitimate and healthy competition into private war, in which labor is arrayed against capital and capital against labor, in which organizations of working men are arrayed against organizations of capitalists—a war the evils of which culminate only in the greater evils of combination and monopoly. Says John Stuart Mill:

"Morally considered, its evils are obvious. It is the parent of envy, hatred, and all uncharitableness. It makes every one the enemy of all others who cross his path; and every one's path is constantly liable to be crossed."

Finally, this system is indicted in the name of that Christian religion whose two cardinal principles it disregards and brings into disrepute—the brotherhood of man and the fatherhood of God. Dividing society into classes, it practically disrupts the first, and whatsoever does that, leads on to the denial of the second.

Such, briefly stated, is the wage-earners' indictment of the wages system. It is not, and does not pretend to be, a judicial picture of modern industrialism, with its lights and shadows, its counterbalancing good and evil. It is, and aims to be, one-sided —the wage-earner's side; the side which he sees as he begins to awken from the long torpor of the past, and, under the influence of an inspiring Christianity, public education, and political liberty, to discover that he is not merely a "hand," but also a head and a heart. In its main features I believe it to be a true indictment—true though both partial and inadequate. The wage-earner combines and strikes not merely for shorter hours or larger pay; his real, though sometimes unconscious, aim is to substitute for the wages system, with all tools and all control in the hands of a few, an industrial partnership, in which the profits, the losses, and the control of the world's industry shall be shared by all, and an industrial oligarchy shall give place to an industrial democracy.

Industrial democracy and Socialism are not identical. But this opens a new topic, which I must leave for a future article. My object in this article is accomplished if I have induced the reader for half an hour to put himself in the wage-earner's place, and to look at modern industrialism from the wage-earner's point of view.

LYMAN ABBOTT.

A DEFENSE OF THE VETO POWER.

In the January number of the Forum an article appeared, entitled "Abuses of the Veto Power," in which the author, Mr. F. A. Conkling, takes rather a somber view of what he calls the "kingly prerogative." He first refers to a few undoubted abuses in the use of this power during colonial times, and then discusses what he considers misuses under the Constitutions both of the United States and the State of New York.

In so far as the charge of abuse refers to the history of the veto in the national government, the indictment seems defective, and against this part of the attack the present article is directed. The evidence upon which the veto power is arraigned is as follows: First, before President Jackson's administration, few bills failed to obtain executive approval, while President Jackson and his successors have vetoed many bills. Secondly, the Whig Party, which was bitterly opposed to the veto power, won the election of 1840. Lastly, President Jackson vetoed the bill for the re-charter of the United States Bank. In short, the article under consideration rests the assertion that the presidents of the United States have abused the veto power upon the number of vetoes compared by administrations, on the Whig victory of 1840, and on the bare fact that President Jackson vetoed a bank bill.

The basis is hardly secure. A mere enumeration of vetoes proves nothing. The inference intended appears to be that a veto is in itself a subversion of the rights of the people, and that, therefore, the more vetoes the more subversion. The premises of this conclusion are not sound. The veto power was granted to the executive by the people through their representatives, as a protection to the Constitution and as a means of preventing the enactment of corrupt, inefficient, or useless laws. Now the fact that vetoes have increased in number may mean that the Constitution has needed more protection of late; or that Congress has heedlessly, or otherwise, passed laws of an objectionable kind;

or possibly that the executive is becoming tryannical. This last supposition seems hardly likely when we consider that the president derives his power from the people and holds office for only four years, and that a two-third vote of the members of both houses, at any sitting when a quorum is present, may override a veto. Moreover, the figures quoted in the January FORUM are not correct. The vetoes of Presidents Polk, Lincoln, and Arthur are omitted altogether, and the records of most of the other administrations are inaccurate. The true figures, as drawn from a careful search through the House and Senate journals for the hundred years, 1789–1889, are as follows, Mr. Conkling's figures being given in brackets: Washington, 2 [2]; Madison, 6 [6]; Monroe, 1 [1]; Jackson, 12 [11]; Tyler, 9 [10]; Polk, 3 [0]; Pierce, 9 [5]; Buchanan, 7 [7]; Lincoln, 3 [0]; Johnson, 21 [13]; Grant, 43 [6]; Hayes, 12 [9]; Arthur, 4 [0]; Cleveland, 301 [274]; total, 433 [344].

Again, it is assuming too much to consider the triumph of a political party opposed to the veto as a proof of an abuse of presidential authority. A statement of the causes of the Whig victory which would be most unfavorable to the veto power, could show only that a large number of the people in the country were opposed to it, and not by any means that the power had been abused. The proof of that assertion must depend upon the actual use of the power, rather than upon what people during a given campaign thought of that use.

In the third argument, President Jackson's refusal to sign the bill for the re-charter of the United States Bank is put forward as an absue of the veto power; it is worth noting that this is the only presidential veto out of the four hundred and thirty-three on the records, to which the article under consideration specifically refers. The reasons stated by President Jackson for this veto, in so far as they are based on the Constitution, are unsound, and if acted upon would materially increase the power of the executive at the expense of the legislative branch of the government. The President, however, had other reasons which were not so fanciful, and in any case his right to veto the bill cannot be questioned. The provision of the Constitution is clear, and it leaves the reasons for a veto wholly in the president's discretion.

Not only is President Jackson's right to veto the bill beyond question, but the object he had in view is also to be commended; for the continued existence of such an institution as the second United States Bank, connected as it was with the government, constantly growing in size and power, and having the strongest motive for controlling congressional action, could hardly have failed to become dangerous to honest government.

It is only just to Mr. Conkling to assume that he would have referred to other specific cases had they supported his position. He has not done so. It is possible, however, to cite numerous vetoes which support the proposition that the veto power has not been abused. Down to President Jackson's administration, no one has suggested that the power was abused. From 1832 to the present time, there have been now and again complaints against the use of the veto. During the last administration, the opponents of the veto, or at least of certain phases of its exercise, were particularly outspoken against the pension vetoes—vetoes which form the most striking example in recent times of executive interference in legislation, and the most numerous group of related vetoes to be found in our history.

The country has been generous, as it ought to be, in its provision for soldiers disabled in its service. But this very generosity has incited many whose claims were of the flimsiest character to seek aid from the government. President Cleveland determined, if possible, to stop the greedy and unjustifiable scramble, and to this end used the veto more than twice as often as all his predecessors together. His purpose is well explained in the following quotation from a veto message: "In reviewing the pension legislation presented to me, many bills have been approved upon the theory that every doubt should be resolved in favor of the proposed beneficiary . . . but heedlessness . . . is unfair to the wounded, crippled soldier, who is honored in the just recognition of his government," and teaches the people that "as against the public treasury the most questionable expedients are allowable." A careful examination of President Cleveland's veto messages compels one to the belief that he lived up to the principles set forth in the passage just quoted. There may have been a few instances in which he used the veto unwisely, but the

errors were due to the great mass of bills to be examined rather than to any fault on the part of the President. It is impossible in the compass of a brief article to examine President Cleveland's vetoes individually. In general it may be said that more than half the vetoed bills granted pensions for diseases which it was difficult or impossible to connect in any way with service in the United States Army, while many other bills were incorrectly drawn or were unfair to the claimant.

The President's course was made the subject of a special report by a Senate committee, in which the legality of the President's action was admitted. But the report goes on to say that it is unconstitutional for a president to refuse to sign a bill merely because he disagrees with Congress in regard to the expediency of the measure. This argument, as we have already seen in considering President Jackson's bank veto, is unsound.

In view of what has just been said, it can hardly be denied that, so far as expediency is concerned, President Cleveland, in vetoing pension bills, was defending alike the public treasury, the disabled soldier, and the public morals; and that so far as constitutionality is concerned, he was acting fully within his right. His vetoes also called the attention of the country to the subject of pension legislation—a service which should by no means be overlooked in estimating the worth of the vetoes; a service which Hon. John D. Long, in an able article on the veto power in the FORUM for November, 1887, considers one of the most important functions of that power.

On many other occasions throughout the history of the United States, vetoes have been based on the same simple ground of expediency. Many bills have failed to secure executive approval because they were incorrectly drawn and would have been useless or worse than useless. This reason was frequently alleged by President Cleveland, while President Grant vetoed, on the ground of inaccuracy, several relief bills, and an act providing for the recording of deeds and conveyances affecting real estate. The veto has also been used to protect the Indians. Bills unjustly depriving them of their lands, and encroaching upon their rights under various treaties, have been defeated by the refusal of the executive to approve them. A very famous use of the

power of the executive to prevent unwise legislation, was President Grant's veto of the so-called "Inflation Bill," in 1874. The President's act in this case saved the credit of the government, and was an important step in the return from a depreciated paper money to specie payment. Again, whatever may be thought of the constitutionality of internal improvements carried on by the general government, there can be little approval of the extremely local and evidently useless expenditure of money which is authorized in many of the internal improvement bills, particularly in recent times. In two instances such bills have been vetoed,* and in a third case the President,† although he signed the bill, declared his intention of not carrying out its objectionable features.

The veto messages so far considered were based wholly on expediency—on the injustice of the proposed laws, or on the lack of skill in drafting them; and although it is true that vetoes of this class have made up a large proportion of all the vetoes, yet there is no lack of cases in which the executive has interposed to prevent the enactment of unconstitutional laws. Many of these vetoes have been for the protection of the executive department from legislative encroachment. One of the most striking instances occurred in the unjustly-criticised administration of President Hayes. It had been the custom for many years to attach amendments to appropriation bills and other measures which the necessities of the government required should become law. These so-called "riders" contained provisions which by themselves either could not have passed both houses of Congress, or would not have received the President's signature. The rider was, in short, a means of coercing the President or the opposing house of Congress, and was therefore a violation of the spirit of the Constitution, which plainly expects that each distinct law shall, on its own merits, receive the approval of both houses of Congress and of the President. Between 1862 and 1875, this method of coercion was employed successfully three hundred and seventy-five times.

During President Hayes's administration an attempt was made by Congress to repeal certain portions of the national election

* One by President Grant; one by President Arthur.

† President Grant.

laws applying to the southern States—an attempt which it was known the President would resist. To overcome this opposition, the bills making the repeal were tacked to five appropriation bills, all of which were vetoed, and vetoed because of the attempt to coerce the President into approving the repeal of the election law. The struggle between the President and Congress was severe, but it ended in the complete triumph of the executive. This victory put an end to "riders," and a provision was later inserted in the rules of the House of Representatives thereafter prohibiting amendments of that character.

The triumph of the President in this instance was a heavy blow to questionable legislation of all kinds. It is much easier to rush an objectionable measure through the various stages of legislation as a part of an important appropriation bill, than to get it through Congress on its own merits, both because its faults are less likely to be closely examined, and because its connection with the money bill will often carry it through, when it could not hope to succeed alone. The use of the veto to check this abuse must commend itself to all. It is, moreover, a use which the founders of the Constitution themselves heartily indorse in their writings.

The president has also used the veto to prevent the enactment of laws infringing his power of appointment. In 1812 Congress passed an act increasing the number of District Court judges. The act decreed that the existing Supreme Court justices should fill the new offices. This was a palpable, though probably an unintentional, violation of the Constitution, since under no circumstances can Congress appoint to office. The bill was an attempt to invade executive authority, and President Madison very properly frustrated it.

The most famous attempt of the executive to defend the power of appointment is President Johnson's veto of the Tenure-of-office Bill. The First Congress of the United States had solemnly declared that the power of removal from office was lodged solely with the executive. The principle was approved by Mr. Madison, "the father of the Constitution," as a correct construction of the Constitution, and Mr. Story upheld this construction as binding; yet the Tenure-of-office Bill took the power from the

president and vested it in the president and Senate. President Johnson, in vetoing so unjustifiable an attack on the executive power, made a most commendable use of his legislative authority; and the merit of the action is not diminished by the fact that a hostile Congress passed the bill over the veto, for subsequent Congresses have been so convinced of its inexpediency that they have repealed it.

Once again the president has been obliged to defend his power of appointment. July 2, 1884, President Arthur vetoed a bill for the relief of Fitz John Porter. The bill authorized the President to appoint Porter to his old position in the army. This attempt to give the President power to appoint an individual to office was unneccessary and unconstitutional. Congress can have nothing to do with individual appointments. The most that it can do is to vest the appointment of certain inferior officers in the president, the heads of the departments, or the courts of law. That is to say, Congress may decide how certain offices shall be filled, but may not say who shall fill them. In the case under discussion the attempt of Congress to fill the office was rightly considered by the President a violation of the Constitution, and he vetoed the bill.

The president has also been obliged to defend his constitutional power in foreign affairs. In President Jackson's administration Congress passed a bill authorizing the Secretary of the Treasury to compromise claims allowed under a treaty with the King of the Two Sicilies. It was in effect authorizing the Secretary to make a new treaty. The President very properly vetoed the bill, on the ground that it was unconstitutional for Congress to authorize the executive to negotiate a treaty; that the executive possessed that power independent of Congress. This position is undoubtedly sound. In 1876 President Grant vetoed a resolution of Congress which directed the Secretary of State to carry on a diplomatic correspondence with the Argentine Republic and the Republic of Pretoria. The President objected to the resolution with good reason, since the reception and control of all diplomatic correspondence is by the Constitution vested in the executive.

The vetoes for the protection of the executive have been

most useful and by no means insignificant. They have protected the president from unjust attack, and helped to maintain that balance of power between Congress and the president which is a fundamental principle in our plan of government. They set up no extreme or doubtful doctrines, are not in any way tainted with corruption, and are, in short, wise, conservative attempts to preserve to the executive its well-recognized powers.

Many other instances might be adduced in which the veto has been used wisely and successfully to defend the Constitution; as, for example, when President Madison vetoed two bills which threatened the constitutional provision against the union of church and state; but it is impossible to consider or even to refer to all such cases.

If a mere recital of the number of vetoes, coupled with a reference to President Jackson's bank veto, is sufficient evidence upon which to base an attack on the veto power, surely the vetoes considered in the present article—Cleveland's pension vetoes, the vetoes of useless bills, the vetoes for the protection of the Indians, Grant's veto of the Inflation Bill, the vetoes of extravagant river and harbor bills, the vetoes for the protection of the veto itself and for the defense of the President's power of appointment and over foreign affairs, and Madison's vetoes for the protection of the principle of the separation of church and state—these vetoes, I say, are a sufficient foundation for a most complete vindication of the veto power. Indeed, these vetoes are more; they are an indication that not only relatively, but absolutely, the veto power has been used wisely. To be sure, it has not been quite what the founders of the government intended; it has not in all cases protected the executive from legislative encroachment, or invariably prevented the passage of objectionable laws; but its faults have been negative rather than positive—sins of omission rather than of commission. In short, the veto power has been used honestly in almost every instance; has been seldom used injudiciously, and almost never carried beyond reason. It is, indeed, no unworthy part of that system of government which a famous English statesman has called "the most wonderful work ever struck off at a given time by the brain and purpose of man."

EDWARD CAMPBELL MASON.

THE ART OF GERRYMANDERING.

WHEN, in 1812, Governor Elbridge Gerry, of Massachusetts, signed the bill dividing that State into fantastically-shaped senatorial districts, so as to enable the Democratic Party to retain control of the Legislature, he by accident performed one of those acts which sometimes give a man more fame than a lifetime of well-directed effort usually brings. Mr. Gerry sat in the Continental Congress, his name can be read on the Declaration of Independence, and he was a member of the convention that framed the Constitution of the United States. The offices he filled were conspicuous and honorable. He was minister to France, governor of Massachusetts, and he died while holding the office of vice-president of the United States; but notwithstanding all these honors and his undoubted ability as a statesman, he would be almost unknown to the present generation were it not for the least creditable act of his career.

Gerrymandering, which was thus introduced into American politics, is the art exercised by the party in power when a State is to be divided into districts, of making its own vote go as far as possible, and of causing its opponent's vote to count for as little as possible, in the election of members of a legislature or of the national House of Representatives. An illustration of how this is done and of the political advantage gained, can be readily given. The following tables suppose a State with twelve congressional districts. The organization which we shall call the First Party, has control of the Legislature, and it wishes to arrange the districts so that it can elect two thirds of the congressmen, and leave to its opponent, which we will call the Second Party, only one third. A study of the last election returns shows the voting strength of both parties in every county. With these figures as a basis, the First Party proceeds to make up the districts. To illustrate, let us take the first three districts made up from nine supposable counties:

Counties.	Vote at Last Election. First Party.	Second Party.	Counties.	Vote at Last Election. First Party.	Second Party.	Counties.	Vote at Last Election. First Party.	Second Party.
Jackson,	3,120	3,880	Perry,	3,680	3,320	Pierce,	3,980	3,420
Erie,	3,280	3,720	Lincoln,	3,150	4,850	Polk,	3,200	5,390
Porter,	3,340	3,660	Grant,	3,750	3,280	Adams,	4,440	3,160

Total vote, Second Party,.....34,680
" " First Party,.....31,940

Second Party majority,..... 2,740

These counties are now redistributed as follows:

First District.	First Party.	Second Party.	Second District.	First Party.	Second Party.	Third District.	First Party.	Second Party.
Jackson,	3,120	3,880	Porter,	3,340	3,660	Lincoln,	3,150	4,850
Erie,	3,280	3,720	Perry,	3,680	3,320	Pierce,	3,980	3,420
Adams,	4,440	3,160	Grant,	3,750	3,280	Polk,	3,200	5,390
	10,840	10,760		10,770	10,260		10,330	13,660
First Party majority,		80	First Party majority,		510	Second Party majority,		3,330

Here are three congressional districts made up from nine counties, and although they have an aggregate Second Party majority of 2,740, they are arranged so as to elect two First Party congressmen, and one Second Party congressman. If the First Party were to make up the other nine congressional districts, the result in the whole State would be something like this:

Districts.	Vote.		Majority.	
	First Party.	Second Party.	First Party.	Second Party.
First,	10,840	10,760	80	.....
Second,	10,770	10,260	510	.....
Third,	10,330	13,660	.....	3,330
Fourth,	11,400	10,300	1,100	.....
Fifth,	12,600	11,800	800	.....
Sixth,	9,800	12,400	.....	2,600
Seventh,	9,400	10,900	.....	1,500
Eighth,	11,300	10,700	600	.....
Ninth,	13,000	11,400	1,600	.....
Tenth,	10,850	12,950	.....	2,100
Eleventh,	11,360	10,460	900	.....
Twelfth,	10,820	9,900	920	.....
	132,470	135,490	6,510	9,530

Total Second Party vote,.....135,490
" First " " 132,470

Second Party majority in twelve districts, 3,020

Notwithstanding the Second Party majority of 3,020 in the whole State, the First Party is able to elect eight representatives, and the Second Party is able to elect only four.

It would be interesting to know to what extent each of the two existing parties is affected by the gerrymandering of its opponent, and how fairly the people are represented in Congress under the present methods. If there were a fair vote and an honest count in every State, it would be possible to answer both these questions accurately. Any attempt, however, to reach conclusions is vitiated from the start by the failure of universal suffrage in some of the southern States. But the following table will aid in forming a correct judgment upon the matter:

States.	Congressmen.		Vote.		Vote to Each Republican Congressman.	Vote to Each Democratic Congressman.	Vote to Each Congressman in the State
	Rep.	Dem.	Rep.	Dem.			
Alabama,	..	8	54,547	117,583	.....	14,698	21,516
Arkansas,	..	5	66,804	89,576	.....	17,915	31,276
California,	4	2	126,060	116,057	31,515	58,028	40,352
Colorado,	1	..	50,620	37,725	50,620	.....	88,345
Connecticut,	3	1	75,129	74,340	25,043	74,340	37,367
Delaware,	..	1	12,935	16,396	.....	16,396	29,331
Florida,	.	2	26,534	39,836	.....	19,918	33,185
Georgia,	..	10	33,476	96,046	.....	9,604	19,760
Illinois,	13	7	372,138	347,562	28,626	49,651	35,985
Indiana,	3	10	265,365	259,987	88,455	25,998	40,411
Iowa,	10	1	212,084	184,384	21,208	184,384	36,042
Kansas,	7	..	182,274	105,129	26,039	.....	41,057
Kentucky,	2	9	152,710	182,035	76,355	20,227	30,431
Louisiana,	1	5	26,827	86,432	26,827	17,286	18,876
Maine,	4	..	79,748	60,977	19,937	.....	35,181
Maryland,	2	4	99,975	106,095	49,987	26,523	34,345
Massachusetts,	10	2	178,841	150,918	17,884	75,459	27,479
Michigan,	9	2	236,898	215,070	26,322	107,535	41,096
Minnesota,	5	..	139,666	108,010	27,933	.....	49,535
Mississippi,	..	7	25,600	88,614	.....	12,659	16,316
Missouri,	4	10	235,668	262,006	58,917	26,200	35,547
Montana,	1	..	19,912	18,264	19,912	.....	38,176
Nebraska,	3	..	106,071	81,838	35,357	.....	62,636
Nevada,	1	..	6,912	5,682	6,912	.....	12,603
New Hampshire,	2	..	45,271	43,935	22,635	.....	44,603
New Jersey,	4	3	146,035	144,160	36,508	48,053	41,756
New York,	19	15	633,520	607,161	33,343	40,477	33,231
North Carolina,	3	6	130,480	148,344	43,493	24,724	30,980
North Dakota,	1	..	26,077	12,006	26,077	.....	38,083
Ohio,	16	5	416,320	395,639	26,038	79,127	38,679
Oregon,	1	..	32,820	25,412	32,820	.....	58,232
Pennsylvania,	20	8	512,217	436,944	25,610	54,618	33,898
Rhode Island,	2	..	22,032	17,051	11,016	.....	19,541
South Carolina,	..	7	9,704	65,915	.....	9,416	10,802
South Dakota,	2	..	54,983	23,229	27,491	.....	39,106

States.	Congressmen.		Vote.		Vote to Each Republican Congressman.	Vote to Each Democratic Congressman.	Vote to Each Congressman in the State
	Rep.	Dem.	Rep.	Dem.			
Tennessee, ...	3	7	136,878	159,507	45,626	22,786	29,636
Texas, ...	..	11	92,707	237,709	.....	21,609	30,037
Vermont, ...	2	..	48,115	19,351	24,057	.....	33,733
Virginia, ...	2	8	147,379	151,881	73,689	18,985	29,926
Washington, ...	1	..	34,939	24,992	34,939	.....	59,931
West Virginia, ..	..	4	73,746	75,485	.....	21,371	39,807
Wisconsin, ...	7	2	171,529	144,878	24,504	72,439	35,156
Totals, ...	168	162	5,521,846	5,584,161	.....	.....	.....

Average vote to each Republican congressman, ... 32,868
" " " Democratic " 34,470
" " " congressman in the whole country, ... 33,654
Democratic majority on the congressional vote, ... 62,315

From this table it will be seen that, taking the country through, there were cast on an average 385 more votes to each Democratic congressman elected than to each Republican congressman elected. But the Republicans will claim with reason that, as in nine districts in the South there were no Republican candidates, many thousands of their votes were unpolled. Neither party casts its full vote in that part of the country; but estimating from past election returns and the natural growth in population, it is safe to conclude that the uncast Republican vote is larger than the uncast Democratic vote. Taking this into consideration, the balance will be found to incline the other way, showing that in 1888 it needed more Republican than Democratic votes to elect a congressman. A better idea, however, of the inclination of parties to resort to gerrymandering to gain an unfair political advantage, can be obtained by taking particular States as examples.

But, in judging whether a State is gerrymandered or fairly divided into districts, it is no test to divide the total vote of each party by the number of congressmen it is able to elect. A State may be fairly apportioned, and yet the minority party be able to elect none of the congressmen, or a smaller number than its vote would seem to entitle it to. Massachusetts is as equitably divided as a State can be; its districts are made up of contiguous territory; they are compact and nearly equal in population; and yet, 178,841 Republican votes in 1888 elected ten congressmen, and 150,918 Democratic votes elected two only. The reason for

the disparity in the number of votes necessary to choose a representative by the different parties in that State, is that the Republican county majorities run evenly through the State. It would be impossible under such circumstances to elect representatives by districts made up of counties, and yet give the minority party the congressmen to which its vote apparently entitles it.

New York gives a most striking illustration of the same fact. The present division of that State into districts was made by the Democrats, but under it they have not been able at any election to choose a majority of the State's delegation in Congress. The explanation is that the Democratic vote is largely concentrated in New York City and Brooklyn, and the Republican vote is evenly distributed over the rest of the State. Kansas has seven Republican members of the House of Representatives and not one Democratic member, and it is a specious argument to assert that it needs only 26,019 Republican votes to elect a congressman, while 105,129 Democratic votes cannot elect even one. But when every county in a State, with two exceptions, gives a Republican majority, it is manifest that the Democrats are not deprived of representation through a gerrymander.

The real proofs whether a State is gerrymandered or not are to be found in the territorial construction of the districts and in the general evenness of their vote and population. If the vote evidently shows that the party making the arrangement tried to group into a few districts counties that give majorities for its opponent, and to distribute counties containing a majority of its own votes among as many districts as possible; if the boundaries of districts are distorted and counties are wrenched from their natural position; and if the vote and population of the different districts vary widely, then it can be justly claimed that a State has been gerrymandered for party purposes. Applying these tests to States that elected congressmen in 1888 from districts arranged by the Democrats and Republicans respectively, it will be possible to determine which party is the more inclined to gerrymander. Ohio gives a very pertinent illustration. In 1888 the arrangement of the districts was Republican, but they have just been re-arranged by the Democrats. Testing the two arrangements by the last congressional vote, these tables result:

VOTE IN 1888, UNDER A REPUBLICAN ARRANGEMENT OF THE DISTRICTS.

Districts.	Vote.		Majorities.	
	Republican.	Democratic.	Republican.	Democratic.
First,	19,336	17,437	1,899	.....
Second,	21,627	20,031	1,596	.....
Third,	20,912	20,497	415	.....
Fourth,	14,500	22,296	.....	7,796
Fifth,	16,081	22,075	.....	5,994
Sixth,	22,434	22,329	105	.....
Seventh,	17,600	16,742	858	.....
Eighth,	20,898	17,628	3,270	.....
Ninth,	19,491	17,267	2,224	.....
Tenth,	18,496	19,637	.....	1,141
Eleventh,	20,802	15,817	4,985	.....
Twelfth,	20,133	19,453	680	.....
Thirteenth,	22,298	24,869	.....	2,571
Fourteenth,	16,211	15,249	962	.....
Fifteenth,	17,591	15,284	2,307	.....
Sixteenth,	19,819	24,444	.....	4,625
Seventeenth,	20,584	15,580	5,004	.....
Eighteenth,	25,249	21,150	4,099	.....
Nineteenth,	22,991	11,091	11,900	.....
Twentieth,	19,381	17,283	2,098	.....
Twenty-first,	20,086	19,470	616	.....

THE RECENT DEMOCRATIC GERRYMANDER, TESTED BY THE VOTE OF 1888.

Districts.	Vote.		Majorities.	
	Republican.	Democratic.	Republican.	Democratic.
First,	17,671	19,245	.....	1,574
Second,	23,292	18,224	5,068	.....
Third,	20,954	23,123	.....	2,169
Fourth,	20,976	23,506	.....	2,530
Fifth,	19,466	22,600	.....	3,134
Sixth,	19,017	18,924	93	.....
Seventh,	18,496	19,637	.....	1,141
Eighth,	17,096	18,249	.....	1,153
Ninth,	19,310	20,237	.....	927
Tenth,	23,929	17,871	6,058	.....
Eleventh,	15,251	17,355	.....	2,104
Twelfth,	21,013	13,281	7,732	.....
Thirteenth,	16,697	17,305	.....	608
Fourteenth,	18,580	21,061	.....	2,481
Fifteenth,	19,128	21,862	.....	2,734
Sixteenth,	17,762	19,330	.....	1,568
Seventeenth,	15,636	16,194	.....	558
Eighteenth,	21,543	14,624	6,919	.....
Nineteenth,	26,276	15,175	11,101	.....
Twentieth,	27,476	18,734	8,742	.....
Twenty-first,	17,402	18,638	.....	1,236

The Republicans were able to elect fifteen of the twenty-one congressmen in 1888, as the first table shows, the election being held in districts constructed by themselves. But they had a majority of 20,981 on the congressional vote, and such a majority will generally carry enough counties to elect from two thirds to three fourths of a State's delegation in Congress. The small Republican majorities, however, obtained in 1888 in six districts, indicate that, while there may have been no gross gerrymander, the Republicans did not lose sight of party interests in dividing the State into districts. But the Democrats, in the arrangement of the districts just made, have obviously gone to the extreme length of disfranchising the majority. As tested by the latest vote on congressmen, the Republicans, with a majority in the State of 20,981, would be able to elect only one third of the delegation. It is very plainly a gerrymander. Indiana gives another illustration in the same line. The present arrangement of the districts in that State was made by the Democrats, and in 1888 the vote on congressmen resulted as follows:

Districts.	Vote.		Majorities.	
	Republican.	Democratic.	Republican.	Democratic.
First,	20,627	20,647	.....	20
Second,	16,653	18,537	.....	1,884
Third,	15,198	18,274	.....	3,076
Fourth,	16,176	16,905	.....	729
Fifth,	17,506	18,210	.....	704
Sixth,	23,424	14,302	9,122	.....
Seventh,	25,500	27,227	.....	1,727
Eighth,	23,084	23,153	.....	69
Ninth,	24,717	20,267	4,450	.....
Tenth,	19,546	18,390	1,156	.....
Eleventh,	21,900	22,375	.....	475
Twelfth,	19,828	20,139	.....	311
Thirteenth,	21,206	21,561	.....	355

The Republicans, as will be seen, had a majority of 5,378; but so skilfully had their vote been massed in three districts and the Democratic vote distributed over ten districts, that less than one fourth of the delegation was elected by the party having a majority of the votes. No such result could follow under any fair arrangement of the districts. It is evident, then, that

Indiana as well as Ohio has been gerrymandered in the interest of the Democratic Party.

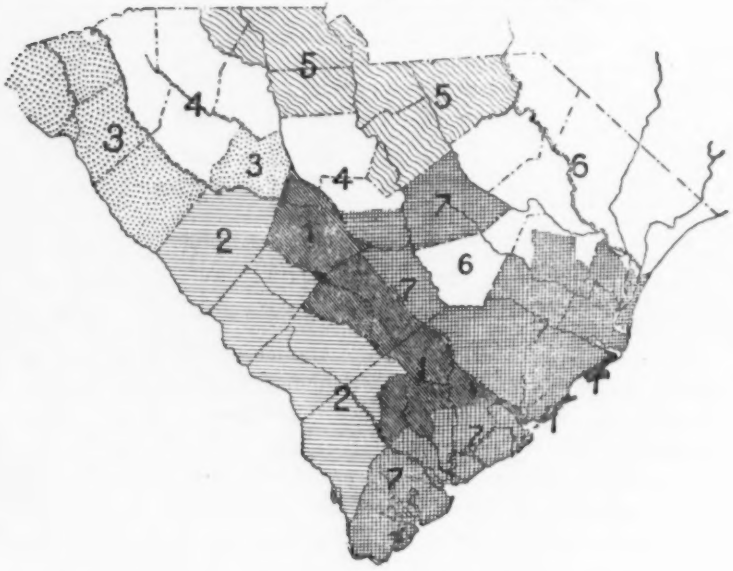
These northern States do certainly afford good examples of the gerrymanderer's art, yet they do not exhibit it in so picturesque a light as some southern States do. The two States in the South which are the most grossly gerrymandered are undoubtedly Mississippi and South Carolina. In both of these States the vote, population, and territorial construction of the districts prove the charge. The following table will make this plain in the case of Mississippi:

Districts.	Population.		Total Population.	Vote.		Dem. Maj.
	White.	Colored.		Repub.	Dem.	
First,	70,670	68,501	139,171	1,732	11,353	9,621
Second,	78,262	90,590	168,852	5,817	13,978	8,161
Third,	25,374	104,471	129,845	4,614	11,624	7,010
Fourth,	82,984	102,987	185,971	2,393	12,855	10,462
Fifth,	91,389	99,484	190,873	3,993	16,247	12,254
Sixth,	59,568	66,200	125,768	3,464	10,580	7,116
Seventh,	63,632	115,823	179,455	3,587	11,977	8,390
	471,879	648,056	1,119,935	25,600	88,614	63,014

The wide disparity in the population of the districts is apparent, one district having 65,000 more inhabitants than another. The construction of the third district could have suggested itself only to some skilled gerrymanderer. It runs along the Mississippi River for 242 miles, or nearly the whole length of the State, while it is nowhere more than one eighth as wide. Its shape entitles it to be called the "shoestring" district.

The State of South Carolina, however, seems to have been reserved as the field in which the gerrymanderer could display his art in its highest development. It is impossible to give a just idea of the arrangement of the districts in that State by the vote or the population, as county lines were disregarded in making them up. It would be necessary to go back to the time of Governor Gerry and the famous "salamander" district, which Gilbert Stuart's pencil made famous, to find a parallel to the shaping of some of the South Carolina districts. A correct idea of how the State is gerrymandered can be gained only from an outline map, such as the following:

MAP OF SOUTH CAROLINA DISTRICTS.



In the four States thus far considered the districts were arranged by the Democrats. Let us look at some examples of Republican districting. In 1888 the election for members of the House of Representatives resulted as follows in Pennsylvania:

Districts.	Vote.		Majorities.	
	Republican.	Democratic.	Republican.	Democratic.
First,	22,523	16,838	5,685	.....
Second,	16,776	12,368	4,408	.....
Third,	*10,017	17,642	.....	7,625
Fourth,	32,841	23,202	9,639	.....
Fifth,	29,466	22,781	6,685	.....
Sixth,	19,299	12,799	6,500	.....
Seventh,	22,226	21,215	1,011	.....
Eighth,	11,731	18,071	.....	6,340
Ninth,	17,373	27,032	.....	9,659
Tenth,	21,796	10,622	11,174	.....
Eleventh,	10,844	9,158	1,686	.....
Twelfth,	16,117	14,618	1,499	.....
Thirteenth,	12,570	13,258	.....	688
Fourteenth,	20,206	13,944	6,262	.....

* Presidential vote.

Districts.	Vote.		Majorities.	
	Republican.	Democratic.	Republican.	Democratic.
Fifteenth,	18,833	12,494	6,339	.....
Sixteenth,	19,204	15,550	3,654	.....
Seventeenth,	11,356	14,012	.....	2,656
Eighteenth	20,583	15,867	4,716	.....
Nineteenth,	16,901	21,480	.....	4,579
Twentieth,	21,739	17,458	4,281	.....
Twenty-first,	24,151	18,930	5,221	.....
Twenty-second,	21,970	13,065	8,905	.....
Twenty-third,	13,990	6,711	7,279	.....
Twenty-fourth,	26,246	21,908	4,338	.....
Twenty-fifth,	21,636	14,481	7,155	.....
Twenty-sixth,	16,924	13,852	3,072	.....
Twenty-seventh,	13,582	9,370	4,212	.....
Twenty-eighth,	14,899	17,588	.....	2,689

The size and general evenness of the majorities given in the congressional districts disprove on their face the charge of a gross gerrymander. The election of less than three fourths of the delegation by a party having a total majority of 75,273, is not unreasonable. Undoubtedly as many districts were made Republican as the vote and situation of counties permitted; but if the plan pursued in Indiana and South Carolina had been followed, every district in the State could have given a Republican majority. To illustrate further Republican methods in congressional districting, the result of the last election in Illinois is cited:

Districts.	Vote.		Majorities.	
	Republican.	Democratic.	Republican.	Democratic.
First,	26,553	22,697	3,856	.....
Second,	12,969	19,051	.....	6,082
Third,	23,671	21,295	2,376	.....
Fourth,	22,273	19,755	2,518	.....
Fifth,	20,077	10,018	10,059	.....
Sixth,	18,139	11,903	6,236	.....
Seventh,	16,380	11,341	5,039	.....
Eighth,	20,596	17,454	3,142	.....
Ninth,	16,871	14,490	2,381	.....
Tenth,	18,824	16,166	2,658	.....
Eleventh,	19,657	17,580	2,077	.....
Twelfth,	16,628	21,938	.....	5,310
Thirteenth,	18,450	21,364	.....	2,914
Fourteenth,	18,570	16,740	1,830	.....
Fifteenth,	19,897	17,204	2,693	.....
Sixteenth,	17,037	17,742	.....	705
Seventeenth,	14,775	19,385	.....	4,610
Eighteenth,	16,151	16,167	.....	16
Nineteenth,	15,615	18,086	.....	2,471
Twentieth,	19,005	17,186	1,819	.....

These two States furnish as strong proofs as any that can be cited of the length to which the Republican Party will go in gerrymandering congressional districts; and while they show that that party takes advantage of its majorities to aid itself, no gross injustice to its opponent is evident. The conclusion is warranted, then, that the Republicans have been more fair than the Democrats in districting States. Since the arrangement of districts was made, under the apportionment of 1882, the Republicans have redistricted one State only. That is Iowa, and the explanation given was that the growth of population in the western part of the State had given some districts a disproportionate number of voters and warranted a rearrangement of boundaries. On the other hand, the Democrats have disturbed the decennial arrangement of districts in four States, and in each instance it has been done with the avowed purpose of gaining a partisan advantage by redistributing the party vote. Ohio's districts have been twice disturbed with this object, and those of Missouri, Kentucky, and Maryland once.

In the light of the record of the two parties in gerrymandering, the principle which has governed each of them seems to be about this: The Democratic Party in defining congressional districts has proceeded on the rule that all is fair in politics as it is in war. The Republicans will probably claim that whatever is bad in their course in this matter is justified by the methods of their opponents; and they will argue as Alexander Hamilton did, when he was trying to overcome the conscientious scruples of Governor John Jay, that popular governments "prove engines of mischief if one party calls to its aid all the resources which vice can give, and the other (however pressing the emergency) confines itself within all the ordinary forms of delicacy and decorum." It will probably be a generation before there will exist a political organization able to rise superior to so specious an argument.

With the evil admitted and the abuses which have resulted recognized, the question of a remedy presents itself. The method which is first suggested for checking gerrymandering, is to take the power of districting States and of controlling congressional elections away from the State legislatures and to give it to Congress. Of the right of Congress to assume full control of the

manner and method of electing members of the House of Representatives, there can be no doubt. The language of the Constitution fully warrants this conclusion. It is as follows:

"**The times, places, and manner of holding elections for senators and representatives shall be prescribed in each State by the Legislature thereof; but the Congress may at any time, by law, make or alter such regulations except as to the place of choosing senators.**"

At first, congressmen were chosen in all the States on general tickets; but the desire for local representation gradually brought into use the practice of electing them from districts into which the States had been divided, until the elections for the Twenty-sixth Congress, in 1838, when only New Hampshire, New Jersey, and Georgia still adhered to the old method of election by general ticket. In that year a dispute arose over the election of five of the six congressmen from New Jersey, and contesting delegations of Whigs and Democrats appeared from that State when Congress met in December, 1839. Such contests are not always decided on their merits; and there was less reason than usual to expect an equitable decision in these cases, because the control of the House of Representatives depended upon the issue of the controversy. The debate which preceded the settlement of the disputed seats is one of the most memorable in American political history, and, as might have been expected, the decision was influenced more by party exigency than by a sense of right and justice. After weeks of turmoil and wrangling, the Democratic contestants were seated and a Democratic speaker was elected.

The Whigs controlled the Twenty-seventh Congress, however, and with the design of guarding as far as possible against the recurrence of such controversies as the disputed New Jersey seats had occasioned, they enacted a law making the election of members of the House of Representatives by districts mandatory on all the States. The Democrats opposed it, and in a few States refused for a time to comply with its terms; but after a few elections there was a general agreement in the wisdom of the measure; and now, after the lapse of half a century, no proposition looking to the election of congressmen otherwise than by districts would be entertained. This was the first and most important interference by Congress in the manner and method of elect-

ing members of the House of Representatives. The Tweed frauds in New York City in the national election of 1868, showed Congress how easily the control of the House might be won by dishonest means, and suggested the passage of the measure known as the supervisorship law. Under this statute supervisors are appointed by the United States courts on the petition of a specified number of citizens in any election district, and they have the right to supervise the registration and watch the casting and counting of the ballots for the election of members of the House of Representatives.

Again, in 1872, Congress exercised its authority by passing a law requiring the election of representatives in all the States on the same day—the Tuesday following the first Monday in November. But as several States still adhered to the practice of electing representatives on the same day that they chose State officers, which day fell on another date, the law was modified so as to legalize these elections. Since then, however, all the States, with the exception of Maine, Vermont, and Oregon, have complied with the terms of the law as originally passed. These three laws mark the extent to which Congress has thus far gone in controlling the manner and method of electing members of the House of Representatives.

It is now a question of debate whether Congress shall proceed further, and, assuming all the powers granted it by the Constitution, take full control of the election of its own members. This would include the division of the States into congressional districts, as well as a supervision of the registration and of the counting and casting of the votes. Against the change, the argument is brought that it would sensibly increase the tendency toward centralization—an inclination which, it is asserted, is too strong already. It is also claimed that it would only exchange State gerrymandering for national gerrymandering, and do nothing to check the evil. The party in power at the time the decennial apportionment is made, might district States so as to aid it in retaining its hold upon the government. If the law should prescribe that there should be no change in the make-up of the districts until the next census, this party advantage would continue for ten years, and it might have a lasting effect upon

the policy of the country; while if the districts could be altered at any time, they would probably be disturbed as often as the shifting majorities in Congress should change.

The arguments in favor of a full supervision of congressional elections, are that Congress, acting on a national scale and with the eyes of the whole country upon it, would proceed with much more deliberation and a greater sense of responsibility than any single legislature. Public opinion could act upon it more forcibly, and as it is composed of a higher class of men, having a wider experience in governmental affairs than State legislatures possess, the arrangement it would make of the districts would be more likely to be just and equitable than it is when the work is left to local governments. It is also claimed that, as a gross gerrymander in any State affects the whole country, by giving the party that makes it an unwarrantable advantage in national legislation, all the States ought to have a voice in the matter.

The best guard, however, against the gerrymandering evil, whether local or national, is an alert and intelligent public opinion. There has been a gradual spread of a sentiment opposed to gerrymandering, and the result is seen in the fair division of a larger number of States under the apportionment following the census of 1880 than under any former enumeration. There is wide room for improvement in this respect, however, and the best way of attaining that end is by a full and free discussion of the subject and by impressing the public mind with the enormity of the evil. If such a debate can be had now, and public sentiment can be thoroughly aroused and can express itself forcibly, the result will be a more equitable arrangement of congressional districts under the census of 1890 than under any previous census, whether the apportionment be made by Congress or by the States themselves.

WALTER C. HAMM.

MODERN ECLIPSE PROBLEMS.

Now that the United States Eclipse Expedition to West Africa has reached the placid isle of Saint Helena, there is opportunity to sit down and quietly think matters over. While it has to be confessed that our efforts were largely foiled by clouds during the critical hours of the eclipse, it will, I think, be generally conceded that much good work has been accomplished, which will make the observation of eclipses easier in the future. But however this may be, it is worth the while now to consider the problems under discussion and the means at hand for attacking them, and to reflect what might have been if our trusted African skies had been clear instead of cloudy. That they were not clear was deeply to be regretted; nor were the clouds merely local at Cape Ledo. Inland to a distance of eighty miles, within which area a half-dozen branch stations had been established, clouds everywhere prevailed. Even out at sea, whither the "Pensacola" had gone a few hours' run in order that the observers on board might perchance get something, even if the sky should be overcast at the shore station, it was cloudy too. And all this in the face of very favorable meteorological indications.

This, by the way, suggests the query I often hear made, whether an eclipse coming on may not itself produce the very clouds which work the astronomer's defeat. To this the answer is that, as yet, no reason is apparent why the advent of the lunar shadow should cause the formation of visible cloud. A portion of the direct solar heat is of course withdrawn from a comparatively small volume of the atmosphere, having the shape of a slightly flaring cylinder about one hundred miles in diameter. The air temperature falls a few degrees only, the direction of the wind may change several points, and there is usually a slight deposition of dew. The barometer does not fluctuate appreciably. But a more satisfactory answer is had on appeal to the cloud records of past eclipses. If there were anything in the

notion that eclipses themselves bring on a thickening of the atmosphere, evidently we should expect to find more cloudy eclipses than clear ones. Of course the data are not at hand for showing the state of the sky all along the track of total eclipse; and our only present means of judging is the success or failure of the parties of observers situate at particular points here and there along the line. The expeditions of 1878, 1880, 1882, and 1883 were generally successful, although the latter, to Caroline Island in the remote South Pacific, came very near losing the total eclipse by reason of thick skies which prevailed except at the critical moments. The eclipse of 1885 was clear in New Zealand; and that of 1886, while partially obscured in Grenada, where the astronomers were all located, was perfectly clear in Benguela, west Africa, as I have since ascertained. Then followed the eclipse of 1887, remarkable for the defeat of expeditions everywhere, from Russia to Japan. But the next darkening of the sun in total eclipse, on New Year's day, 1889, was equally memorable for transparent skies all the way from California to Manitoba; while this last eclipse, which passed for the most part in clouds in the eastern hemisphere, favored the observers with clear skies in the western. Every one may now judge for himself.

But now to the problems of the eclipse proper. I pass by those relating to the accurate prediction of eclipses, and to the location of eclipse stations. Important as they are, I take it that the simple means which the astronomer employs in this part of his work is already sufficiently a matter of general knowledge. Also, I do not need to tarry more than a moment to remark the usefulness of these phenomena in improving the elements of the lunar motion, whereby the accuracy with which the moon's place among the stars may be predicted is greatly enhanced. A half-century ago, this, with the converse problem of finding longitudes on the earth, was the main objective point of the astronomer in the observation of solar eclipses. But now all is changed, since longitude can everywhere be found by chronometers and telegraph cables. If, however, the verifying and correcting of the lunar tables in the interests of navigation were the main end of eclipse observations, the expense of expeditions

to remote localities would scarcely be justifiable, as the lunar predictions are already so nearly perfect that they would probably satisfy the needs of the practical navigator for perhaps a half-century to come. But when the more critical requirements of the astronomer are regarded, the lunar theory, as it is called, is in a confessedly unsatisfactory condition; and not only mathematical research of a high order, but observations of the moon's place by all possible methods—by stellar occultations, meridian transits, and solar eclipses—are absolutely necessary to bring the theory and tables of the moon's motion into perfect shape. So eclipse expeditions include observations of this sort as a matter of course; indeed, it was the work of this kind that it was able to do which saved the present expedition to Africa from entire defeat. The sun partially eclipsed was photographed more than one hundred times behind the clouds. Astronomy of precision gained, while solar physics lost.

For the most part, however, astronomers and physicists of to-day have greater interest in total solar eclipses because they afford the only opportunity of investigating the sun's surroundings. Also, certain electric and magnetic phenomena have come to be worth observing, and the prosecution of studies in solar radiation is not to be neglected. Here, it may be, is a great variety of occult phenomena for future investigation; and the most recent theorizing points to the likelihood that the solar corona, and the magnetism of the sun and that of the earth, have all to be studied as a single problem. And an immense and difficult one it is.

The corona itself, however, is now universally regarded as the prime object of attack. And any one, scientist or not, seeing a total eclipse for the first time, would not for a moment question why this is so. The solar corona is the most striking of celestial phenomena—a halo of filamentous structure and silvery radiance encircling the jet globe of the moon hung in mid air. It compels our reverence. Of it Professor Langley, in his "New Astronomy," justly remarks that "the spectacle is one of which, though the man of science may prosaically state the facts, perhaps only the poet could render the impression."

If asked to name the eclipse problem which most appeals to

me, I think I should say the "reversing layer." It so happens that the dispute about its actual existence is not yet over, and the chief parties to it are two unquestioned authorities in solar physics. Our own Professor Young is *pro*, and Mr. Norman Lockyer, of England, is *con*. Professor Young himself says:

"The reversing layer of the sun's atmosphere owes its scientific recognition mainly to an observation made by myself during the Spanish eclipse of December, 1870. The observation referred to was this—and an exquisitely beautiful thing it was to see: the slit of the spectroscope, attached to a powerful telescope, was adjusted tangent to the sun's image at the precise point where the last ray would vanish under the advancing moon. A few moments before totality the spectrum still preserved in the main its familiar appearance, except that certain lines, usually only flickeringly and faintly bright at the sun's limb, were now steady and conspicuous. This was specially true of the three magnesium lines, and the mysterious line of the corona; the other countless dark lines remained hard and black. But the moment the sunlight vanished, the dark lines instantly flashed into colored brightness, shone for two or three seconds, and then quickly faded away, leaving still visible only those which had been bright before totality. Of course, in the two or three seconds during which the phenomenon lasted, it was not possible to be quite sure that *all* the dark lines were thus reversed; and in this uncertainty lies the opportunity for varying interpretations of the phenomenon. The natural interpretation, in the light of what was then known, was that this bright-line spectrum which flashed out so beautifully is due to a thin sheet of gaseous matter, overlying the luminous clouds which constitute the so-called 'photosphere,' and containing, in the vaporous form, all the substances which reveal themselves to us by the dark lines of the ordinary spectrum."

It will be observed that the matter is supremely important. Professor Young himself took the long journey to Russia three years ago to re-observe, if possible, this remarkable reversal of the spectral lines. Months later Professor Pickering devised for the Californian eclipse of last year an ingenious form of photographic spectroscope, wherein the trail spectrum was to reveal at the critical instants, both before and after totality, either the reversal of the lines or their continuity as darkness. Should the reversal take place, the rate of motion of the plate, combined with the length of the broken section of the lines, and the distance of the sun, would show the real depth of the reversing layer. By the courtesy of the Harvard astronomers, this same instrument became part of the spectroscopic equipment of our

present expedition. But on no one of these three occasions has any result been possible, and the problem is still unsolved.

Then there are the curious shadow bands—to take up details in approximate order of occurrence. And very hard things they are to put the scientific finger on. Just a few seconds before the corona flashes out in total eclipse, dark narrow bands are usully seen swiftly flitting across the landscape. All the elements pertaining to them apparently vary from one eclipse to another, thus adding greatly to the intricacy of the puzzle. Sometimes about eight inches broad and two or three feet apart, at others only one or two inches broad and ten or twelve inches apart, they travel at one time about as fast as a man can run, at another with the velocity of an express train. While visible at eclipses generally, just after totality as well as before, occasionally an eclipse occurs without their being seen at all. These impalpable shadow fringes have not yet been sufficiently observed and studied to render it possible to make more than a fair guess at what they are; but most likely they are due to irregularities of refraction, by our atmosphere, of the slender beam of light from the waning or waxing crescent. The direction of the wind appears to coincide with, if not to control, the direction in which the bands travel; they have indeed been somewhat poetically described as "visible wind." During the last three total eclipses, the apparatus has been at hand for obtaining instantaneous photographs of these nimble, shadowy fringes, as they swiftly traverse a bright ground; but without results. The experiment promises well, and must be repeated.

I may now consider the corona itself. A half-century of total eclipses has cleared up a few obscurities and added many perplexities. Astronomers generally are no longer in doubt about the substantial, if not entire, reality of the corona as a truly solar phenomenon. That is a good deal to have settled. The moon, if it has anything at all to do with the corona, aside from the simple fact of its coming handily in between sun and earth so as to allow a brief glimpse of something startlingly beautiful which otherwise we should never have known, is probably responsible for only a very narrow ring of the inner corona light, of pretty even width all round. This is conceded as dif-

fractive effect; but the problem still remains how great this width may be, and whether the diffractive annulus varies in width, as it likely does, from one eclipse to another. On settling these questions, we shall be in a position to excerpt the spurious streamers from the true, and analysis of the solar corona may then proceed unhampered.

Perhaps the most striking fact developed by research upon the phenomena of mid totality, is that the axis of symmetry of the corona does not coincide with the sun's axis of revolution as determined by long observation of the solar spots. This might have been expected, but astronomers were a long time in getting at it. Then comes the question, What is the angle of divergence of these two axes? Or, if we regard the earth as a great magnet, and the sun as a great magnet too, may not the poles of the corona mark the position of the magnetic poles of the sun? Zöllner was, I believe, the first to guess this relation; and if, as I suspect, there is much in the recondite researches which Professor Bigelow * has already ably begun and is persistently following up, the guess is far from being a wild one. But the eclipse part of the problem—I mean the actual determination of the solar coördinates of this possible "magnetic pole"—would be easy enough, only that observers in the past have too often paid little regard to precise orientation in pictures of the corona which otherwise are unexceptionable. All that is needed is the geometric means of drawing the sun's axis across the photograph, and the required datum for each picture is then had at once, by direct measurement of the angle it makes with the coronal axis. This latter is very sharply defined on photographs taken with large telescopes driven by highly-accurate clock work. Also, it must not be forgotten that the center of the moon will nearly always fail of exact coincidence with the center of the sun; as a consequence whereof the full discussion of a photograph of the corona implies correct knowledge of the longitude and latitude of the place where it was taken, and of the local time of mid exposure. Unluckily these matters have too often been treated

* "The Solar Corona, Discussed by Spherical Harmonics." By Professor Frank H. Bigelow. City of Washington: Published by the Smithsonian Institution. 1889.

with indifference; but the eclipses of another decennary will perhaps provide the data required for this fundamental discussion.

The true solar corona appears to be a triple phenomenon. First, there are the polar rays, nearly if not quite straight throughout their visible extent. Gradually, as these rays start out from points on the solar disk farther and farther removed from the poles, they acquire increasing curvature, and very probably extend into the equatorial regions, but are with great difficulty traceable there because projected upon, and confused with, the filaments having their origin remote from the poles. Next may be considered the inner equatorial corona, the lower regions of which have the semblance of an outer solar atmosphere. Apparently these are intimately connected with truly solar phenomena, quite like the polar rays. Then there is the third element in the composite, the outer equatorial corona, made up of the long ecliptic streamers, for the most part visible only to the naked eye; also existing as a solar appendage, and possibly merging into the zodiacal light.

The precise pictorial portrayal of an object so complex is utterly impossible save by photographic means. One good photograph is worth more than a bushel of hand sketches; in fact, the latest photographs, like those by Pickering, Barnard, and Burckhalter, of the eclipse of January 1, 1889, show, it is to be feared, the practical worthlessness of all hand work, except upon the long faint streamers; and here photography has been largely a failure. In point of fact, it amounts to this, that a long series of exposures of varying lengths has to be made with each lens, and the whole combined into a composite by means preferably photographic. In no other way can the whole corona be photographically depicted as the eye would see it in every part.

Also, there are problems of size and form of apparatus still awaiting solution. What size of lens is best adapted to photograph specific parts of the corona? Should the full aperture be used, or should it be reduced? Do lenses figured for the actinic rays offer great advantages over those not so figured? Are not reflecting telescopes with metallic specula in every way better adapted to coronal photography than refractors? Much light is

still demanded upon these and other matters governing the proper equipment of eclipse expeditions.

Then, too, the photometry of the corona in every part is a problem requiring critically-arranged apparatus. Nearly all this work is now best done photographically. The plates need to be standardized before developing; and series of exposures, through closely perforated disks, are no less required than in the merely pictorial work. Then, after the sensitized surfaces have been successfully exposed and developed, the real work upon them is just about to begin. Tedious measurements by the thousand must be made upon the intensity of the coronal light in every part. Professor Harkness's discussion of the photographs of 1878 indicated that the light of the corona varied inversely as the square of the distance from the edge of the sun, but more recent work appears to show that this cannot be a general law applicable to all eclipses. So the redetermination of the formula from the photographs of every new eclipse becomes a matter of investigation. In addition to this, the entire light of the corona is an important factor which must be evaluated for every totality in terms of some recognized standard.

The foregoing considerations on the simpler problems of the corona will suggest the complexity of those researches which have to be essayed and pushed to completion, if our way through the confusing labyrinth of the coronal filaments is ever to be successfully threaded. Indefinite in variety are the problems which arise; and a century of faithful study of eclipse phenomena will be of but little avail in unraveling the mysteries bound up in the intricate bundles of this filamentary structure, unless the questions are attacked with the utmost vigor and persistence. A larger amount of apparatus, particularly spectroscopic, for detailing the lines in the coronal spectrum for a large number of different areas of a given corona, and a greater variety of apparatus, photometric and polariscopic, as well as spectroscopic, must be brought to bear upon future coronas. Especially should every precaution be taken in the preparation of photographic plates, and in the provision of dispersing media of various sorts, to insure the registry of all possible lines in the spectrum of the corona, from the red through the ultra-violet.

The eclipse work of the African expedition, while itself a blank in so far as actual photographs of this particular totality are concerned, has, as it seems to me, occasioned a significant advance in the right direction. Much of the energy of the expedition was concentrated upon the contriving of photographic apparatus which, once "loaded" and set a-going, should take entire care of itself from one end of totality to the other. The principle of the device was a pneumatic commutator which exercised perfect and automatic control over a score of instruments of all sorts. To explain its working here would involve too long a digression, but its thoroughly satisfactory performance at Cape Ledo has demonstrated that one man can now operate thirty or forty photographic telescopes quite as readily as he could two or three by former methods of management merely manual.

Also, advantage should be taken of every opportunity to multiply future eclipse stations, at localities as widely separate as possible, in order that the chances of entire loss through prevalent cloud may be minimized.

Many more are the problems of modern eclipse observation, but I restrict myself to the mention of but a few. Special spectroscopes are applicable to a variety of problems, not the least of which is a general spectrum of the eclipsed sun, extending to a distance of two degrees and more on each side. Then, too, the hydrogen prominences come in for a share of the spectroscopist's attention; for, contrary to the popularly-accepted notion that these objects are quite as well studied without an eclipse as with, the critical observations of Tacchini at Caroline Island in 1883, and at Grenada in 1886, show conclusively that a given protuberance observed before totality becomes a vastly more complex object if followed with the spectroscope into the period of total obscuration, and further show that these objects are down-rushes of material relatively cool. The bearing of this important observation upon solar theories is so significant that astronomers ought again to add prominence-research to their eclipse programs, quite as in the days before the memorable discovery of Janssen and Lockyer in 1868. Then, too, Mr. Lockyer's possibly fluted spectra have to be most critically looked

for, if perchance they may shed more light on his fascinating meteoritic theory of the origin of celestial species.

The long-suffering intra-Mercurian planets would, I fancy, be still regarded as a legitimate eclipse problem by only a small contingent of the astronomical fraternity. If, however, there are cameras enough, one of large aperture and short focus would properly be assigned to the photographic outlook for such bodies; because, with precautions, there is the possibility of its doing good work upon the outer streamers of the corona as well. The only remaining problem which I need to cite here relates to the possible rapid variation of detail in some of the coronal streamers. Rarely does an eclipse take place without offering opportunity, however small, of attacking this important question. It is only necessary that photographs be taken at stations widely remote from one another, and with instruments, plates, exposures, and developments as nearly as may be alike. Then, if the sun's altitude is about the same at both stations, and careful comparison of the two photographs shows identical streamers, in identical position, in both, it is inferable that the corona has not changed appreciably in the time occupied by the lunar shadow in traversing the earth from station to station. Near the equator, the rate of the shadow's motion is about one thousand miles in an hour's time; and it is sometimes, though rarely, possible to select a pair of stations two or three thousand miles apart. The general result from the eclipses of 1871, 1878, and 1889 (I.) is that, while the corona may vary from hour to hour, there is good evidence that it remains unchanged from minute to minute. The greatest time difference ever secured was short of an hour; and it is matter for serious regret that this salient research, admirably planned in the late eclipse, has come to naught. The preparations were on a scale never before attempted, particularly those of the English parties in South America and in Africa. The former were successful, the latter not; and the question must now be tabled, with all the others, until the eclipses of 1893 and 1898. There will then be a wide opportunity for choice of stations in a pair of continents, and a rich harvest in solar physics seems sure to be garnered.

DAVID P. TODD.

PERPLEXITIES THAT CANADA WOULD BRING.

A NUMBER of men on both sides of the boundary, whose motives are freely impugned, and yet whose motives are, on the whole, I think, better than their judgment, are forcing the question of annexation upon the people of Canada and the United States. That they have not been entirely unsuccessful in this, is due certainly not to any novelty in the theme, but rather to the fact that the advocates of annexation appear to have begun to take themselves seriously.

Now I am too thoroughly a Canadian not to believe in our great value to any nation with which we should be willing to ally ourselves, or to harbor a doubt of our ability to become a great nation ourselves; and yet one cannot but see that we should bring certain political difficulties to the United States, not arising so much, perhaps, from our unworthiness, as from their weakness. The triumph of democracy as represented in the Republic is not yet complete; in fact, little more has yet been done than to fix attention upon the more serious problems of democracy. You—if I may presume an American audience—have the stagnant South to direct into channels of industry and prosperity. You have the labor giant awaking fitfully from his drugged slumber, and muttering socialism, or meditating rapine and bloodshed, or exploding dynamite bombs at the Haymarket. He will be the life of the nation when once awake, but it will tax the keenest faculties of your government to steady his waking movements. Then there is a Catholic school problem in Massachusetts, a Mormon problem in Utah, a "foreign-element" bugbear in New York and Chicago, a tariff conflict between the opposing interests of different sections, and many other knots at whose corded complexity your politicians must tug. These snarls in the skein of the future are not merely disadvantages, as political problems often are to other peoples; they entangle the life line of the nation. You can bear great pressure

at almost any other point. A war, an invasion, a commercial crisis would not unsettle your foundations, but the political chess board cannot be more deeply complicated without serious danger. This is the weak spot in your armor, and at this spot the annexation of Canada would strike at least three heavy blows. I am not troubled, as some are, about your ability, or even your willingness, to carry our public debt or to bear any other like burdens, but the trio of problems that this article will outline might well provoke on your part serious apprehension.

It is evident at a glance that Canadians would go into the American Union without affiliations to existing American parties. Their own party lines would be well-nigh obliterated by the discussion of annexation, and the feelings of the people toward American parties would be almost wholly determined by the things said by the leaders of those parties during the international negotiations. It is quite probable that these feelings might be far from weak, should one party appear to be the champion and the other the opponent of Canadian interests; but they would be common to the entire Canadian people, would be based upon matters wholly Canadian and local, would be easily changeable were a kindness done us by the hitherto critical party, and would but intensify our disposition to look at Washington legislation through Canadian spectacles.

We should be in truth a Canadian party interjected into American politics. When a Republican Congress in the national interest enacts a law that happens specially to affect Iowa, the Republican Party in Iowa becomes official counsel for the new legislation. Practically one half of the politicians of the State, because of their desire that their party shall continue to control the national government, are directly interested in commending this new measure to the favor of their fellow citizens. The other half are, of course, as surely retained as counsel in opposition to the measure. But, at their worst, the Democrats can do no more than play upon the local feeling and try to persuade the people of Iowa that their State interests are being sacrificed by the Republican Party; and they must carry on this sectional argument against opposing counsel and before a jury one half of which is prejudiced against them.

But the state of affairs in annexed Canada would be far different. In Canada there would be no counsel for the nation. There would be no section of the people willing to risk the lightest local interest for the triumph of a national party. Our politicians would be all retained for Canada, outvying one another in endearing themselves to the people by the keenness of their jealousy for "Canuck rights"; and the people would be only too ready to take alarm at the first intimation of the approach of the sleepiest possible kind of a "wolf." We should constitute a perpetual opposition, always alert to find a grievance in the management, by the national executive, of Canadian affairs.

It is impossible, of course, to predict how the American government would deal with this kind of thing. A czar would merely increase the strength of military occupancy and send a few of the keenest patriots to Siberia, but this direct method is hardly open to the party government of a republic. We in Canada have had to face a mild form of this problem on a small scale, and, as politicians are very much alike the world over, the plan followed by ours in this case might be some indication of the path that those at Washington would tread. Our method was, stripped of all verbiage, public bribery. The Province of Nova Scotia was our disaffected region, having been brought into confederation somewhat against its will; but our policy of conciliation, which consists in building a railroad to every man's door, and cumbering the Province with public works, has been almost as effective as costly. As the result, the Nova Scotians elect a provincial legislature overwhelmingly for secession, but send to Ottawa a majority supporting the federal government. Whether American politicians should follow this method or should choose another, the difficulty that would be presented by a distinctively Canadian party would be a grave one, constituting a political problem of first-rate importance.

The second problem that I wish to outline is of the nature of the first, concentrated, embittered, and made perpetual. It will be found in the anti-annexation or ultra-British party, left of necessity under arms at the signing of the annexation agreement. The composition of this party would depend somewhat upon the course of the campaign, but its main features can be easily fore-

seen. Annexation could never be carried without the support, or at least the consent, of Quebec, and with that consent no tremendous majority would be needed in Ontario. No one knowing anything of Ontario at present could fail to pick out many of the elements of this anti-annexation minority. The Imperial Federationists would be there, as well as a large share of the Orange body, and the backbone of the Presbyterio-Protestant Sabbath-observing people of the Province—pluckiest of fighters and most persevering believers in their own rightness.

Can there be any doubt as to the grave danger of dragging this element by force into the American Union? It would be neither small nor uninfluential, and the public ear would be turned toward its jeremiads most kindly. Minorities are not disinclined to believe themselves misused, and especially is this true of a minority that has to hold its own in the face of a strong, progressive, and at one time hostile, people. A pro-British speaker would always have at his command two of the most thrilling chords in the whole vibrant harp of the emotions—that recalling the "good old days" to memories in whose sight distance hides the darker gullies and softens the hill tops, and that arousing a people against foreign rule with cries of tyranny and injustice. And pro-British speakers there would be; for these men are, many of them, descendants of those British loyalists of the last century who left opulence in New England for niggardly subsistence in the forests of Canada that they might live under the British flag. It would be hardly too much to say that this would be a disloyal element in the Republic, and, what adds to the danger of its presence, disloyal as a matter of conscience.

Your leading statesmen are considerably alarmed at the foreign element in your population, the gravamen of the charge against them being that they are not in sympathy with the American spirit. But they are not disloyal; they have signified in a practical manner their preference for the government of the United States over any other government in the world; they become citizens of the Republic voluntarily, not under compulsion and against their strongest protest; and yet they are thought to be a source of danger. What then would be a people openly disloyal; ready, at least in the near past, to bear arms against the

Republic; not only without the American spirit, but saturated with the British spirit? If Americans are rendered nervous by mere lack of sympathy, they should hesitate before taking to their bosom antagonism, disloyalty, and possible rebellion.

The third and most serious problem that Canada would bring into the Union is now to be seen, ready-made, in the Province of Quebec. If ever annexation shall become possible, it will be because of the problem that that province now presents to Canadian statesmen. The difficulty is at once one of race and one of religion, and has inherited all the bitterness and passion and prejudice of the bloodiest wars of Europe, in which Protestant has been arrayed against Catholic and Frank against Saxon. For one, I believe that we in Canada shall solve this problem ourselves on the broad basis of Protestant toleration and of trusting the "*habitant*" to think out his own freedom as he has in his native France, and that thus annexation will be banished from the region of the possible; but, should my belief have drawn too much of its life from preference, and should annexation become an issue in practical politics, Americans would do well to look carefully into the matter and learn that Quebec as a State in the Union would be a much more difficult enigma than even Quebec as a Province of Canada. Our acceptance of annexation would be a confession that Quebec the Province had driven Canadian statesmen in sheer bewilderment to national suicide—Canadian statesmen, remember, who have practically no other problem of first-rate importance to solve. Then this problem would be complicated in Quebec the State by a union with the ambitious Catholics of your country, and would be rendered more insistent and insidious because the prelates of Rome would be playing for larger stakes. Consider the effect of laying this knotty problem upon the already cumbered council board of your nation.

Certain writers have been pleased to tell you that in the Union the problem of Quebec would solve itself; that while it might possibly wreck the Dominion, still, once in contact with the aggressive, Protestant, nineteenth-century spirit of your nation, its difficulties would disappear. In my humble opinion, nothing of the kind would happen. You know well whether the Catholic Church with you is now quiet or restless. Massa-

chusetts can tell you. Wisconsin can tell you. New York can tell you. From all quarters of the Union you can hear the thunder at your school-house doors. You know, too, that your young Democracy can keep its lithe fingers upon the throat of that mediæval power simply because that power has not been able to mass its forces in any one State with strength sufficient to obtain the control. Quebec would supply that want. Quebec would become your Ireland. Quebec would give to the mother church a State vote in the election of the president, in the Senate, in the House of Representatives.

When Quebec shall offer for annexation, the government at Washington may set up a needle's eye through which she must pass naked, stripped of every privilege of race and religion; Congress may take every precaution possible and take it to the full; but unless the history of Romanism has been written by contraries, the care will be taken in vain. Rome has never yet been unhorsed while the horse remained faithful. When, in the quiet of peace, the horse has time to think, to feel, and, looking around, to see the burden it carries, the day of that Roman rider is over; but in the clangor of conflict, when the hostile lance pricks the steed far oftener than the rider, the mad rush of the papal charger has never failed. Those magnificent stallions, France and Italy, when left in serene peace by their Protestant neighbors, threw their popish riders, while Catholic Bavaria, fighting for its religious life at the Protestant court of Berlin, is sturdier, more faithful, and, I suspect, nearer victory to-day than ever. We in Canada—at least some of us—propose to let the horse roll in Quebec where it can crush nothing but its own daisies. The American Union could not allow that, when the first plunge might wreck the public-school system. In a word, we have the room here for the throes of another Italian liberation; you have not. Every abridgment by the American government of the privileges of the ecclesiasts of Quebec, would but make the people more firmly attached to their bleeding church. You may take from his Eminence the Cardinal every peculiar weapon that he holds, but you cannot take his solid vote—a vote that, if left alone, would loosen and disappear, but that, under your chastening hand, would be compacted into the solidity of granite; and

you could not leave it alone, for that would mean, were the Quebec church in political union with the American church, removal of the pressure at Boston as well as at Quebec.

It is only too clearly evident what Quebec the State, once within the Union, would accomplish. The more compact her vote should grow through pressure of persecution, the more formidable would she be. She would become the redresser of Roman Catholic grievances the Republic over. Did the Republican Party rudely blight Catholic school aspirations in Massachusetts, it would be punished at the next presidential election by the loss of the Quebec State vote. Democrats, were they recalcitrant, could be similarly treated at another time. For there would be one solid State vote in the Union then that would favor the parties as the parties should favor the church. Another means of obtaining the vote of Quebec the State, would be to proffer her restored privileges, such as she enjoyed as a Canadian Province; and it can hardly be doubted that such bids would be made, publicly or privately, when a neck-and-neck presidential election should induce politicians to try every expedient.

There is in my breast, in common with the great majority of Canadians, an abiding hope that our country will never so much as look toward annexation—not because the Americans are not a great people, but because we believe that our form of democratic government, molded in the furnace of British history, is the best in the world. Still, with the present cat-and-mouse attitude of Ontario and Quebec, one can never tell what will happen; and should our good sense desert us in a passion-swept moment, then ought American caution—knowing a little of the political pill offered—to come to our rescue and set us back on our own broad feet.

A. R. CARMAN.

THE NEWSPAPER OF THE FUTURE.

AMONG newspaper editors there is a suspicion that the monthly reviews and magazines are too nearly approaching the field of journalistic competition. It has been complained by the magazinists, whose favorite topic is the faultiness of the newspaper press, that the tendency of the newspaper is toward literary pauperism and trivialities; but, with strange inconsistency, the reviews and magazines appear to be imitating the qualities that they have condemned in the daily journals. To read the complaints of approaching competition that come from the daily papers, one would suppose that they dread the entrance of rivals into their own peculiar field. But the change in the conduct of the magazines should gratify the journalists. Imitation, we are taught, is the sincerest form of flattery; and that spirit of enterprise which is reckoned absolutely essential to successful journalism has in some degree infected the conductors of the magazines. Nobody need be surprised, under the circumstances, if every man who has aught to do with a printing press should be seized by a frantic desire to be "ahead of all contemporaries."

Perhaps the audacious foray of the newspapers into the field of general literature may have invited reprisals in kind. The daily newspapers have manifested a disposition to make their special editions, notably those of Sundays, as much as possible like those of cheap magazines. It is the frequent boast of the publisher of a daily paper that his journal is a small library in itself. The Sunday paper, voluminous as to sheets and multifarious as to contents, proudly carries contributions on topics recondite, as well as of contemporaneous human interest. Special papers by special contributors, essays, biographical sketches, elaborate reviews, and a mass of matter that makes tolerable pretensions to being literature, constitute the greater part of the load of one of these special editions of a daily newspaper. Is it surprising that the impartial observer regards the deflection in the

line of the magazine as the result of a too-sharp rivalry with the daily newspaper? If the monthly publication carries too many articles of transient interest, is it not true of the newspapers that they aim to be low-priced rivals of the magazines? If this is the state of the case, who opened the competition between these once-differing classes of publications?

There are observers of this novel complication who think that they see in it the promise of a compromise, in the shape of a daily newspaper that shall be a *news*paper without the faults and follies of the thing that goes now by that name. In its ambition to be everything and to have everything, the newspaper has traveled far beyond its legitimate bounds. The complaint of the magazines indicates the overstepping of these bounds on one side; the more excited protests of an invaded privacy tell of a like outbreak on another; on all sides, in short, the barriers are giving way. The original functions of a daily newspaper appear to have been forgotten. Keen competition among themselves has finally brought newspaper people to a condition of feverish and anxious eagerness to make everything within reach their own. Everything printable is printed. Nothing is so low that it cannot be stooped to; nothing too remote and abstruse to be reached after.

The name of the newspaper once indicated its single function and mission in the world. The first newspapers were news letters, written or printed, and passed from hand to hand for the dissemination of the news of the day. Nobody seems to have dreamed of circulating a sheet, whether written or printed, for any other purpose than this. After a while, the editor introduced comments on the news contained in his paper, explaining and elucidating; and these modest observations, becoming imbued with the opinions of the editor, were eventually evolved into the editorial article, or leader. About this time, or very soon after, certain enterprising tradesmen, perceiving the value of this new channel of communication with buyers, availed themselves of it for the purpose of advertising their wares. It is a fact worth recalling to mind, that the first advertisements were those extolling the virtues of patent medicines. Next came the record of events in the locality of publication; letters from dis-

tant correspondents followed, and the evolution of the newspaper was complete.

The most obvious faults of the daily newspaper of the present day are its inaccuracy and its partisan unfairness. From these failings the magazine is at least tolerably exempt. The daily newspaper has become so untrustworthy, with its looseness of statement, its disregard of truth, and its often willful perversion of facts, that fair-minded men sometimes say that they find more satisfaction in reading the journals of the party to which they are opposed than in reading those of their own political faith. One may not accept as trustworthy a statement found in one newspaper till he sees it confirmed by others. If the monthly magazine shall ever become a daily newspaper, let us hope that its first and last purpose in life will be to tell the whole truth accurately. In the feverish race to "distance all contemporaries," the daily metropolitan journal too often throws decency and discretion to the winds. Things have finally come to such a pass that none of these will believe the others. They are all busy in discrediting one another's news, denying the accuracy of one another's reports, and undervaluing one another's enterprises. In such a state of things, what can be expected of the general public, looking on at the jealous contention from the outside? The impartial observer is often tempted to say: "Gentlemen, you tell the truth about one another."

Very much of the so-called slovenliness of the daily newspaper is unavoidable. It is absolutely impossible, in the hurry and rush of putting together the latest news and getting the paper to press, that all the matter in its broad sheet shall read smoothly and be entirely conformed to the canons of style. The literary quality of a daily newspaper cannot be as finished as that of a book, or even of a monthly magazine. Small wits, and some great ones (Oliver Wendell Holmes, for example), have spent much sarcasm on the inaccurate and slipshod style of the hapless reporter. The poor devil who writes his last paragraph for the paper just as the press is ready to begin its revolutions, may surely be excused if his rhetoric is a trifle shaky. But this needful haste does not excuse the failure to verify rumors and chase down facts—a failure responsible for much of the loose-

ness of statement that is now so characteristic of the daily newspaper. It may seem preposterous to say that no item of news, no alleged fact, should be printed until its trustworthiness has been fully established. A consuming desire to be the first to tell the tale, true or false, has given the daily newspaper of to-day its notorious character for untrustworthiness. Of course we make no account here of the so-called newspapers that are indifferent to the truth or falsity of the stuff they print; these are beyond the pale of reputable journalism.

Political partisanship is the bane of modern American society. In every department of human activity, politics seems to be a determining factor. Almost all the daily newspapers are political newspapers. They are bitterly partisan, the so-called independent journals being as unfair as any of the brood. A journal that pretends to give the news and does not give it impartially, can hardly be called a *news*paper. It is a partisan sheet that misrepresents, distorts, magnifies, suppresses, or colors the news to suit the views of the manager. Even the headlines that garnish the daily record are made to do duty as innuendo, argument, or wilful perversion of the truth that follows. The ingenuity with which news common to all the newspapers of any given community may be twisted and colored, is sometimes marvelous to behold. The ingenuous seeker after truth who hunts for it in the columns of three or four journals of diverse political faith, may well be confounded. Let us imagine a man whose reading is confined to one newspaper and whose ideas of the news of the day are derived wholly from that sheet; is it not likely that he will be habitually deceived? Gatherers of news take their cue from the management of the journal to which they belong. Sometimes they are instructed to color all that passes through the alembic of their thought. It is obvious that the strongly-partisan newspaper must needs be conscienceless, dishonest, whether unwittingly or intentionally.

Of course if these things are true of the news department of the newspaper, we need not expect fair treatment of themes in the editorial columns, where the prejudices and obligations of the writer are likely to be brought into play. It may be said of the editorial writers on the American press, that they evince a breadth

of horizon and an intelligence beyond what we discover in any similar class of writers on the foreign press. It is true that they discuss topics of foreign origin with a certain levity that often shocks the visiting stranger; but they are usually able to handle these with fairness, good sense, and sound judgment. We should be amazed to find American questions discussed in a London newspaper, for example, with the same degree of skill and intelligence which characterizes the handling of English questions in any American newspaper of recognized leading.

It is lamentable that partisan strabismus should seize upon almost every American leader-writer when he comes to the discussion of the questions that most occupy the attention of American readers. In our country, unhappily, the trail of politics is over pretty nearly everything that enters into the affairs of men. In Congress and the State legislatures, parties instinctively take opposite sides on every matter that comes up for legislative consideration and settlement. It would seem as if each waited to see which side its opponent would take, before throwing its influence for or against any proposition.

This habit has so fastened itself upon the daily newspaper, that many readers are doubtless surprised when they look into their favorite journal and find that that oracle has discovered politics in a matter that only the day before seemed wholly removed from the political field. This habit of regarding everything with reference to its possibilities as a political question, is an insufferable and growing nuisance in public life and in one sort of journalism. Invasion of the privacy of the individual is frequently held up to scorn as one of the grossest abuses of the press. But that is nothing when compared with the habitual, persistent, and malevolent misrepresentation of public men who happen to be political leaders. Possibly many people like this sort of thing. Like Mrs. Battles at whist, they love a good hater. But men who do not know how false and dishonest all this miserable business is, are habitually imposed upon. The partisan editorial writer habitually lies to his readers. He glozes the faults of his own political friends, and misrepresents the failings, real and imaginary, of his adversaries. The partisan editor, whatever he may himself think, never by any chance permits his readers to learn the whole truth.

There is no need, however, for us to descant further on the faults and shortcomings of the newspaper as it exists to-day. Heaven knows that critics, reviewers, and essayists, to say nothing of statesmen in Congress, have often enough held up to public reprobation the weaknesses and the vices of the foremost power in all Christendom, the newspaper press. It would be more to the purpose, perhaps, if we were to look ahead a little, to discover if there is any possibility that the evils of which we are so often reminded may not be cured, or may not cure themselves, in the course of time. The most discouraging feature of the so-called sensationalism of the present age is that the people seem to like it. Like many another evil thing, it flourishes on the frailties of mankind. If every man could be brought to despise the sensational and lying sheet, as no doubt the reader of these lines does, that disgrace of an honorable profession would speedily perish from off the face of the earth. But the phenomenal prosperity of the despicable thing does not indicate that high-strung general moral sense which we like to believe is ours. There is hope, however, that we have reached the lowest depth of the deplorable business, and that journalism will after a while experience a species of moral uplift that will raise us all into a higher and purer atmosphere. It really seems as if things could be no worse than they are; and the experience of mankind teaches that when matters are at their worst, the time for them to mend has come.

As we have seen, the real purpose of the newspaper has been defeated by its own mismanagement. Nobody expects to find the truth about public men and public measures fairly and candidly stated in the political newspapers. As we have seen, too, that variety of matter known by the slang name of "fake" has become so common, that we are obliged to discredit everything that is printed in the newspapers. In such a depressing condition of things, perhaps the better portion of the newspaper fraternity will resort to honesty, fair dealing, and conscientious treatment of the news, in sheer self-defense. Reformers on this line need not expect to be understood and believed at first. They must allow the shock of novelty to pass away. Popular disbelief of the newspaper may have become too deeply seated

to be removed at once; but, as the copy-books have taught us, truth is mighty and will prevail—after a while. Like a new Columbus in a heedless and gainsaying world, the coming leader in the new enterprise may vainly knock at many doors before he will find recognition and good cheer; but mendacity, partisan injustice, and general harum-scarum cannot always succeed in journalism.

The newspaper of the future will rid itself of the smartness and flippancy with which the newspaper of the present is too often disfigured. Its writers will be selected for their learning, careful literary training, and fairness of judgment. Verbosity is one of the most-dreaded terrors of the average newspaper reader. He is likely to think that an erudite, thoroughly-informed writer must needs be dull and prosy. Let us admit that we cannot possibly endure long, dull, editorial articles, and that we will not have a colorless, dry statement of facts in the news columns of the journal of our choice. But is it asking too much of human nature—newspaper human nature—that the paper shall be crisp and bright without malice, learned and intelligent without dullness? No sensible person expects that political parties are to be disbanded or hooted out of existence. The parties and the newspapers will remain for many a century to come. But men will learn that it pays to be fair and honest in politics as in diplomacy, and in many another field of human activity in which lying was once thought to be part of the best equipment. Then readers, tired of the fruitless hunt for truth and fairness in the columns of the political newspaper, will be gratified with an answer to their demand for a change to something better.

It may seem like a Utopian theory of a newspaper that is here hinted at; but it should be borne in mind that this is an age of experiment. On the whole, perhaps it should be a matter for surprise that we have gone on so long in the bad old way, or rather, in the old way continually growing worse. When the newspaper of the future comes—clean, bright, honest, impartial, accurate, painstaking, and absolutely just (allowing for the frailties of poor human nature)—we shall doubtless be surprised that we have so long endured the crude methods, conscienceless habits, and reckless haste of the journalism of to-day.

It is inevitable that the ideal newspaper will be more costly than the newspaper of the present; for, with all their boastfulness of princely expenditure and magnificent enterprise, publishers and editors are not willing, apparently, to pay for the verification of the matter they print. They are too much afraid of their "enterprising" competitors to risk being beaten in the race for news. When raw and untrained men on the reportorial staff of a daily newspaper shall give place to those whose mental discipline and ripe judgment shall fit them for their station, it must be admitted that the maintenance of a staff of such writers will dismay some of the publishers of daily newspapers who now think very highly of themselves for their munificent management. But, unless all signs fail, the newspaper press, now steadily discrediting itself with the world of readers, will eventually be compelled to learn that it has forgotten its calling and has ceased to be a *news*paper.

It is a common saying that advertisements are the life blood of a newspaper. Its circulation is valuable, from the counting-room point of view, only as offering special inducements to advertisers. As we have seen, the original idea of the newspaper was to furnish the news. When we return to that idea, the advertiser will be relegated to his proper subordinate place; perhaps he will disappear altogether. In the fearless and independent administration of a daily newspaper, the publisher's department is often a serious drawback. It is apt to be officious, if not influential, in directing the editorial conduct of the paper. This is especially true of the country papers, those rural leaders of public opinion on whose unbiased judgment so much depends. In these days of voluminous Sunday editions, as if the crushing amount of reading matter pitchforked into the paper were not sufficiently embarrassing to the buyer, pages on pages of advertisements are foisted upon the unfortunate reader. He thinks to buy a newspaper, and is loaded down with an advertising sheet. To the general newspaper-reader, this is simply an impertinence. It is pretended that every man is greatly interested in the advertisements of a newspaper. This is notoriously untrue. The delusion is kept up for mercenary reasons sufficiently obvious. The reader will learn, after a while, that the printed matter, outside

of the little that he really wants to see and read, is a mere superfluity, and that its cost is met by the revenue from an intolerable amount of advertising in which he has no interest whatever. He has been beguiled into buying twenty or thirty pages of printed stuff of various sorts and kinds, in order that he may glean out of the mass a page of information concerning the history of the world for a day.

The proposition to abolish or even to curtail the advertising portion of the daily newspaper, will be met with a howl of derision from the conservatives who think that what is must always be. But when newspapers shall be printed for the edification and enlightenment of mankind, as they will be some day, mankind will not buy a bushel of chaff for the sake of finding in it a few grains of wheat. On that simple principle the newspaper of the future will be conducted. Possibly the "cheap and nasty," whose price and whose quality are equally low, will still find a market. Possibly, too, advertisers who are now desperately climbing over one another in attempts to get out of the hurly-burly of the daily newspaper advertising columns, will seek some other less crowded and more hopeful channel of communication with the public of buyers. Undoubtedly the popular belief in the saving grace and the supremacy of the advertisement in the newspaper will expire reluctantly, but the time will come when the advertising sheet must lead an existence separate from the newspaper.

The tendency to dogmatize, apparent in many of the newspapers of the present day, is an abnormal outgrowth of the old-time modest editorial utterance. There is too much editorial writing. Uncandid opinions and assertions have unsettled popular belief in the infallibility of the journalistic pope. His oracular givings-out are often regarded as of little worth and are often absolutely unheeded. The man who in this age of "hustling" has barely time to glance at the headlines of the morning paper, treats with scant courtesy the able leading articles that adorn its editorial page. Not only so, but impudent disregard of truth, and a perverse habit of making the worse appear the better reason in public matters, are having their perfect work in the undermining of the editorial influence of the daily newspaper. Local reporters, correspondents, and even the

manipulators of the telegraphic news, impertinently thrust their opinions upon the reader at every turn. Every newspaper-manager knows the correspondent with "views," and the local reporter with convictions, who are determined to edit at long range the newspaper of which they are only *attachés*. This attempt is too often tolerably successful. The newspaper of the future will be no less opinionated, perhaps, than that of the present; but it will be more honest and candid, and therefore its utterances will be more worthy of respect. What is quite as important as a matter of reform, editorial opinions will be expressed in their proper and legitimate place, not spread all over the paper. In that day, the man who shall look in the best newspaper for the news, will not be compelled to swallow the prejudices and notions of the editorial staff along with information from the four quarters of the globe.

Almost all unattained good seems unattainable when seen from a distance. The ideal newspaper is certainly remote just now; but perhaps it is not so far away as it may seem to be to the weary watcher. When a good thing comes, men wonder how they have rubbed through life so long without it. When the newspaper of the future shall have come, a world of readers will be gratified that the remnant of nineteenth-century journalism then surviving will have been spared only for the minority of mankind.

NOAH BROOKS.

GUNPOWDER AND ITS SUCCESSORS.

UNTIL the propulsive force of saltpeter was discovered, the arms of the savage and the civilized man were too nearly alike to enable the discipline of the latter to obtain more than temporary advantage over the former; but since the regular employment of explosives in warfare, the periodic irruptions of barbarians have ceased; and they will never recur, notwithstanding the Tartar hordes which still exist, and the sensational ideas occasionally advanced as to what they might do if supplied with modern weapons. Such weapons require the mechanical faculty of western civilization for their care and maintenance. Even the civilization of southern China is not adapted to them.

The ancients had no suspicion of the energy that the chemical forces of nature might substitute for muscular strength. This is shown by a study of their war machines when they advanced from hand weapons to those embodying more power. All of these were animated by the tension of cords or springs liberated by a trigger, and imparting a propulsive force to stones, arrows, or beams. Chemicals were first used for starting fires, and the incendiary projectiles were torches or pieces of ignited wood, together with pitch, sulphur, naphtha, and resins—substances easy to inflame and difficult to extinguish. Once being thrown, they adhered strongly to any object struck by reason of their viscosity; and the heat produced by their combustion rendered them more fluid and caused them to flow in every direction, carrying the fire with them. It was possible, however, to extinguish these flames by deluging them with water and cutting off the supply of air, or by covering them with sand, which would lower the temperature below the point of ignition; and such projectiles could not be thrown with high velocity without being extinguished by the refrigerating and abrading action of the air.

The discovery of Greek fire remedied these defects, and for

many centuries the terror it inspired brought victory to the Byzantines in naval battles. This substance is first mentioned in history about A.D. 670, as the invention of Callinicus, who destroyed with it the Moslem fleet besieging Constantinople. The secret of its composition was carefully guarded by the Greeks, and its effects were much magnified by the ignorance of the soldiers and sailors. It was said to be inextinguishable itself, and to impart the same quality to everything it touched. It was also said to burn downward as well as upward, which was in those days considered an extraordinary phenomenon. Nothing positive has come down to us regarding the exact composition of this fire, because all the constituents are mentioned by the Greeks except the vital one; but from the researches of modern chemistry it appears more than probable that its essential ingredient was nothing but saltpeter. Its hissing, flaming, and roaring in the air, which were among its most frightful qualities, would thus easily be accounted for; and as saltpeter contains its own oxygen, it is almost inextinguishable when combined with carbonaceous matter. Men completely clad in armor were not injured by Greek fire; stone structures were not damaged, nor were wooden ones, if covered with raw hides. Treason or corruption finally caused the secret to pass to the Moslems, who made use of it during the fifth crusade and afterward, throwing it in huge casks with the various ballistic machines of those days. In naval combats it was thrown from copper tubes mounted in the bows of the galleys, by the tension of cords and springs. The Arab writers mention many compositions used in this way, consisting of resin, pitch, sulphur, etc., mixed with saltpeter in varying proportions. Regarding saltpeter itself, it is probable that the Chinese made the first use of it in fireworks. It is called by old writers "Chinese salt" and "Chinese snow," but it is difficult to fix Chinese dates on this subject earlier than A.D. 969, in the regin of Taï-Tsou. The Chinese never developed its use in war except with the aid of foreign engineers.

The ancients employed in war other chemicals besides those that have been enumerated. Vinegar was used to extinguish Greek fire, and Hannibal is said to have used it in conjunction with fire to break the rocks when he crossed the Alps. Salt was

strewn on arable lands, and geese were pastured on the sites of razed cities to render them barren. Geber, the Arabian alchemist, discovered nitric acid in the eighth century. Sulphuric acid was known in the fifteenth, and phosphorus in the seventeenth. It is probable that all these substances were used in conjunction with the known weapons of melted lead, boiling oil, Chinese stink pots, and glass vessels filled with snakes; but the effects of these latter weapons are principally moral, and it is the material effect that is to be sought for.

For hundreds of years Greek fire was thrown only by mechanical means; and though it was the forerunner of gunpowder, the use of its own gas as a propelling force is first specifically mentioned in the writings of Marcus Græcus, about the tenth century; and at that time it took the form of a rocket. It is not until the end of the thirteenth century that the first clear mention of a powder for throwing projectiles is found. It appears in an Arabic manuscript of that era, which gives a composition of 10 drams of saltpeter, 2 of charcoal, and 1½ of sulphur. This was the fundamental discovery which changed the art of war. Cannon came into use in Europe about 1338, and small arms followed; but progress was at first not rapid, owing to the difficulty of controlling the irregular action of the powder, which was full of dirt and of very variable quality. There was also the strong opposition which a new invention always encounters —an opposition natural enough when one considers that nowhere in the world is there so much at stake as on the field of battle. Another element of opposition was pride in the use of arms, for which particular nations were famous. The English, for instance, employed bows at the siege of the Isle of Ré in 1627, nearly three hundred years after the battle of Cressy, at which their first artillery was used. Wooden cannons bound with rope or leather were first employed, then bars of iron hooped, and next solid metal. After this the progress was in some respects abnormal. Enormous size was speedily reached; brass guns throwing stone balls of 600 and even 1,200 pounds were not uncommon. Mahomet II. used one of these in breaching the walls of Constantinople, in 1449, and some of the same species are mounted at the Dardanelles now, or were a few years ago.

Breech-loading was speedily accomplished; the English had breech-loading cannon in 1545, and Cortez also at the conquest of Mexico, in 1519. Nearly everything in the way of revolvers and repeating guns can be found in the museums of Europe; but none of those devices could in those days be perfected, owing to the backwardness of the mechanic arts. Muzzle-loading, with all its defects, was fixed upon as the only reliable system for service down to within forty years; since that time built-up guns, rifling, and breech-loading have all been successful in both large and small calibers.

During all these years powder remained almost constant in composition, viz., 75 per cent. saltpeter, 15 per cent. charcoal, and 10 per cent. sulphur. At first it was used in the form of dust, but toward the close of the fifteenth century it was discovered that when formed into grains its force was increased. Afterward it was found that glazing enabled it to resist the action of the air and to bear transportation, and later that the size and density of the grains had a marked effect upon the rate of combustion and upon the uniformity of pressure. During our civil war, Major Rodman, in experimenting for the most suitable powder for the smooth-bore 15-inch gun, reached a rough, almond-shaped grain an inch long, which he called mammoth powder. Since that time grains have assumed a more regular shape, usually a hexagonal prism pierced with holes. Each size of gun has its own size of grain; and in large guns the cartridges, instead of being loosely-filled sacks, have their grains uniformly arranged, so that the holes correspond, and the whole is carefully sewn up in woolen serge. It was formerly considered that the most suitable length of bore for a cannon was eighteen times the diameter or caliber. With a gun shorter than this, part of the charge was blown out without burning; with one longer than this, the powder was no better burned, and friction in the bore diminished the range. In the reign of Charles V., a 36-pounder smooth-bore, fifty-eight calibers long, was cast at Genoa; it did not have the range of a 12-pounder, and was cut off. Our largest guns are now from thirty-five to forty calibers long, and rapid-fire guns are from forty to forty-five calibers, since it is now possible to make powder which, while exerting less pres-

sure on the gun than the old powder, will give greater velocity to the projectile if the gun is rifled and long enough to burn it all.

Within recent years we have reached a point where the composition itself is changing. The first alteration was in the use of under-burned charcoal, together with sugar and about 1½ per cent. of water; this produces the chocolate-colored, or cocoa powder, which is the best at present in general use and gives magnificent ballistic results. In an 8-inch gun at Annapolis, a charge of 100 pounds has lately given a velocity of 2,000 feet per second to a 250-pound projectile (equal to a range of about eight miles), with a pressure of less than 13 tons per square inch in the breech of the gun. But this powder makes more smoke than the black, and its endurance of hot temperatures and climatic changes is not well established. A reliable smokeless powder is now being sought in many different fields, but so far successfully only in two: first, substituting nitrate of ammonia for nitrate of potash (saltpeter), and straw charcoal for wood charcoal in ordinary powder, and using less sulphur; secondly, using one of the forms of nitro-cellulose or gun cotton —that is, treating cardboard with nitric acid, re-treating it with ether (which converts it into a species of celluloid), pressing and cutting it into grains, and sometimes adding camphor to make it slower. Cordite, which resembles cord, or more nearly vermicelli, is another form, and is a remarkable example of progress in the arts. Thirty years ago, Baron Von Lenk, in Austria, made a long-fibered gun cotton which he wove into cartridges resembling the cylindrical wicks of argand lamps, with a block in the wick to keep it from collapsing. These cartridges, of sizes suitable for field artillery, were introduced into thirty batteries of the Austrian army. Smokeless powder was an accomplished fact. It deteriorated in store, however, and the factory blew up. Now we have cordite, which will probably again be woven into Von Lenk's cartridges.

So far perfection has not been reached with any of the smokeless powders. They do not keep well, and have a tendency to absorb moisture, the result being a change in the rate of burning and consequent pressure in the gun. In the course of experi-

menting, however, marvelous results are being obtained. In France a powder for small arms has been discovered which behaves in exactly the reverse manner from ordinary rifle powder, the pressure being greater at the muzzle of the rifle than at the breech; and velocities of over 4,000 feet per second have been obtained with the bullets.

A hundred years ago Paixhans invented the explosive shell, in which powder was used, and now we are introducing more powerful explosives in place of the powder. Torpedoes, too, have come into existence, and up to the present day gunpowder has been used in them; but hereafter we shall see explosive gelatin, dynamite, and gun cotton adopted almost exclusively. The first is the most powerful, the second the cheapest, and the third the most convenient to handle. Their relative efficiency under water, compared with powder, is by volume 138, 100, 66, 14, and by weight 142, 100, 80, 25. In air and in hard blasting their efficiency is greater. All three detonate, that is, they totally explode without lapse of time, while powder burns and gives a gradual push. Regarding the utility of firing small masses of high explosives in shells, there has always been a difference of opinion, which is quite independent of the possibility of doing it. Commander Barker, of the United States Navy, at Newport, in 1874, suggested the idea, and was perfectly successful in firing nine 24-pounder shells filled with dynamite, using service charges of powder; and Commander Folger, at Annapolis, in 1884, fired twenty-two 12-pounder shells, ten of which were under service conditions, with equal success; and there have been examples abroad of the successful use of other high explosives. But it is usually considered dangerous, and in firing common shells from modern guns it is possible to break them into such fine pieces that, notwithstanding the strength of the bursting charge, the radius of explosive effect will be much less than if larger pieces were propelled by powder. There have been some English experiments which support this view. Within recent years, however, attention has been attracted to the desirability of using small masses in armor-piercing shells. These shells have but a small cavity for the bursting charge and are filled from the rear. If powder is used, the heat generated in passing through

armor is sufficient to ignite it prematurely, and the shell is usually so strong that the base plug is simply blown out. Gun cotton, either wet or saturated with paraffin, can be rendered sufficiently sluggish to pass through armor without ignition, and one of the problems of the day is to find a delayed-action fuse that will detonate it at the proper time afterward. The Italians claim to have solved this problem up to a thickness of five inches of armor, but excellent English authorities say that no one has yet succeeded. The trouble is with the fuse.

But it is in the use of large, thin-walled shells, which are not expected to penetrate an object, but to crush it, that we may look for the most startling results. In Italy and Germany, 48 pounds of wet or paraffined gun cotton have been thrown from mortars, and in France, more than 77 pounds of melinite—an explosive made from picric acid, gun cotton, and gum arabic, and about three times as strong as gunpowder. In this country we have thrown 600 pounds of dynamite and explosive gelatin from the pneumatic gun. The danger of premature explosion in the gun is much greater when the weight of the bursting charge is very great in proportion to the weight of the shell; and the practice in Europe is to use ordinary guns and to deaden the explosive as in armor-piercing shells, only in this case it is deadened to get it safely out of the gun, a powerful exploder or fuse being inserted to recover the energy at the end of its flight. In this country the opposite course has been pursued with the pneumatic gun, in which a regulated pressure of air permits the use of any commercial explosive. The difference is radical, as the pressure in a mortar is thirteen to fifteen tons per square inch, and is liable to vary a ton or two either way, while in the air gun only about a thousand pounds per square inch is used, and it can be regulated within three or four pounds, the range being changed by altering the pressure. This matter has opened up a new field for investigation, and the chemist will soon be called upon to discover a smokeless powder which will produce absolutely reliable pressures as low as 1,000 pounds per square inch, and from that to 5,000; but an air or steam gun will always have the advantage of being able to change the pressure at will without reloading. Against stone, brick, or sand the effect of large masses

of high explosive is very marked, as would also be the case on or over a ship's decks or in the water alongside; but against vertical armor of even moderate thickness their execution up to the present time is zero. Ten pounds of dynamite in a cigar box, resting upon a four-inch iron plate lying on the ground, will blow a hole through the plate; but if the plate is vertical, five times the quantity will have no effect. The power was there; what became of it? We must learn to direct this energy.

Nitro-glycerin and gun cotton are the most important high explosives. Both were discovered about 1846, but neither was of practical value until about 1860, when Nobel, a Swede, discovered a cheap method of manufacturing nitro-glycerin and afterward of making from it dynamite and explosive gelatin. Abel, the English War Department chemist, discovered about the same time a safe method of making and keeping gun cotton by pulping it so that it could be washed free of superfluous acid. In Paris during the siege an exhaustion of the gunpowder supply was feared, and the ablest chemists were employed to find a substitute. Although the powder did not give out, many useful forms of dynamite were discovered, which were extensively used in the various sorties for destroying obstacles. The subject, moreover, has never been dropped, and there exists to-day in France a "commission of explosive substances," presided over by M. Berthelot, the father of thermo-chemistry, who has carried the whole subject from the sphere of empiricism to that of scientific investigation, and enabled his disciples to analyze any explosive and to indicate what its force will be, and also to discover new compounds which shall possess properties designated in advance. He commenced by investigating the phenomena of heat developed both in the formation of an explosive and in its decomposition, and discovered the key which unlocked the mystery that had previously surrounded all explosives. Nitrate of potash (saltpeter), for instance, was for centuries known to be useful for powder-making, but no one knew why it was so. Lavoisier discovered a hundred years ago that it was a vast magazine of oxygen; but sulphate of potash is an almost equally vast reservoir of oxygen, yet it cannot be used for making powder. It was reserved for Berthelot to discover that nitrate of potash in

decomposing with charcoal gives out a large quantity of heat, while sulphate of potash under the same circumstances absorbs an even greater quantity. Since it is the heat which expands the gases resulting from explosion and gives them their energy, the value of the discovery is obvious. Advancing from this point, he has developed a system by which he investigates the characteristics of an explosive and expresses them. Nitro-glycerin, for example, is expressed as follows: Formula, $C^6H^2(AzO^6.H)^3$. Weight corresponding to formula = 227 grams. Heat disengaged at constant volume by one kilogram = 3,059 calories. Volume of permanent gases for one kilogram = 713 liters. Specific pressure of one gram in one cubic centimeter = 10,950 atmospheres. Velocity of explosive wave = 5,000 meters per second. With this knowledge of each explosive they can all be theoretically compared. In practice, the maximum work of an explosive is not equal to its theoretical potential, and the results vary according to the purpose for which it is employed. Many dynamic or static-measuring machines have been devised for particular objects by Abbot, Berthelot, Trauzl, Chalon, and other eminent engineers.

The chemical analysis of the products of combustion shows a wide difference of results. Ordinary gunpowder has 68 per cent. of solid residue, while nitro-glycerin not only has no solid residue, but has a surplus of oxygen; that is, in 100 pounds of gunpowder there is only enough oxygen to consume 32 pounds of it in a useful manner, and the remainder, 68 pounds, is converted into solid chemicals of no expansive force, which are blown out of the gun. In nitro-glycerin there is more than enough oxygen to burn all the other components. Substances containing oxidizable constituents can therefore be added to it with advantage, and this has given rise to the numerous mixtures found in the market. Gun cotton mixed with nitro-glycerin utilizes the surplus oxygen of the latter in the most efficient manner, and produces explosive gelatin, the most powerful practical explosive known. Nitro-glycerin is also made into a solid by mixing it with powdered silica, which will absorb 75 per cent.; and this constitutes dynamite. These changes of physical condition modify the susceptibility to shock, and oftentimes in an unexpected

manner. For instance, explosive gelatin ordinarily requires six times as much as dynamite, but if frozen it requires less than dynamite.

All explosives are liable to detonation by "influence"; that is, the detonation of one mass will explode another of the same kind at a distance, and possibly masses of other kinds also. The results of experiment are anomalous and unaccountable. Champion and Pellet had reason to think, from some very interesting experiments, that there was a vibratory musical wave to which each explosive was susceptible. Abel supports this theory, and it is said originated it. Berthelot proved to his satisfaction that this theory was incorrect, and advanced another, which supposes an explosive wave that does not cause the second body to vibrate, but which the second body arrests, and absorbs the living force threof. Later, Threfell advanced a theory, derived from experiment in a glass tank of water, that there is a vortex ring movement, rolling in on itself like a ring of cigar smoke, but in an irregular manner, which would account for the lack of uniformity of explosions by influence at different distances and in different directions. Whatever may be the correct theory, we know that fulminate of mercury produces a shock to which all other substances are sensitive, and hence is better adapted for exploders than any other. This is probably due to its density. It is very heavy in proportion to space occupied, and its shock is more intense within a limited radius than that of any other explosive. Regarding the sensibility to influence of other explosives—and there are some three hundred and fifty of them—we are much in the dark. The matter is of minor importance when it applies to torpedoes, and the safe distances from each other at which they can be planted have been established; but now that we are commencing to throw large masses from guns, the exact shock at which each kind will prematurely explode should be determined.

F. M. Barber.

THE NEWER WEST.

FROM the Missouri River, anywhere between Leavenworth and Sioux City, to the Pacific Ocean, a bird's flight, however direct, would cover more than 1,400 miles of territory. From the British dominions to the Gulf of Mexico, on a course marked southward from Pembina upon the Manitoba line, our aërial messenger would also traverse 1,400 miles. When the writer first crossed the Missouri River, early in 1856, this vast region was almost a solitude, practically unknown even to geographers. A considerable portion of it appeared on their maps as the "American Desert." Eastward, the nearest railroad points were Iowa City and Jefferson City, both not less than 200 miles away. Westward, California had some 26 miles of railroad, and it was several years before this lengthened out to 31 miles. It was still nearly two years before the telegraph crossed the Missouri and moved on westward. The pony express was evolved during the next year; the first overland mail had been received but a year before. From the Red River to the Gulf, and from the Missouri River to the Pacific Ocean, there would not have been found a total American white population of over 150,000. The whole number of persons inhabiting the region in the summer of 1856 could not have exceeded 450,000. The Indians would have numbered 200,000. The hybrid Mexican population found in south-western Texas and New Mexico, then including Arizona and a considerable portion of southern Colorado, was about 100,000 strong. The whites were found in largest numbers in California, in Oregon, in Missouri west of the river, and in south-western Texas; 25,000 were in the newly-organized Territories of Nebraska and Kansas.

A few days before this article was begun, the writer returned from an extended journey (made on public business) through the same region—the latest of many which he has made under all sorts of conditions during the intervening years. This one

covered more than 14,000 miles, of which all but a few score were traversed in well-appointed railroad cars. The work undertaken was one which enabled all those engaged in it to obtain an excellent insight into the economic conditions, the social aspects, and the public feeling of all the States and Territories of the far West. It gave extended opportunity for a study of the changes that have occurred. The official purpose of the journey had reference only to the region beyond the 98th meridian of longitude west of Greenwich. Eighteen States and Territories were visited and traversed. The contrasts offered by this region to the solitude of 1865 were almost amazing. West of the meridian named there are now at least 22,000 miles of railroad, and of telegraph wires not less than 150,000 miles. Of telephone and electric-light cables, in proportion to population, there are more miles in use than elsewhere within the United States. There is to-day more property owned *per capita* than elsewhere on the continent. Two fifths of the national domain is found west of the line given, and certainly three fifths of the remaining public lands of the United States must be sought for in the same region; and that, too, without considering Alaska. Yet how few persons are cognizant of the fact that, east and west, the geographical center of this Union is somewhere in the Bay of San Francisco; for with the Aleutian Islanders flying our flag within 50 miles of the Siberian coast of Asia, our domain extends, on a north-western and south-eastern line, some 3,000 miles beyond the Golden Gate.

Returning, however, to the solid earth, and eschewing what seems hyperbole, the region between St. Paul, Great Bend, Fort Worth, and the Gulf, on the east, and the Rio Grande, San Diego, and Tacoma, on the west, contains at this writing a population of about 5,000,000. It may support, under conditions that are realizable, a population of 100,000,000. This statement is made with full knowledge of the contemptuous sneers it will evoke from the learned ignorant and the unthinking sciolists who accept opinions and form conclusions at second hand.

This newer West had eight senators in the last Congress, and the same number of representatives. Four new States have been recently admitted; there are now sixteen senators and thirteen

representatives. Four additional senators and two additional representatives, from Idaho and Wyoming, will be seated before the present session of Congress shall adjourn. Kansas, Nebraska, and Texas, with six more senators and twenty-two representatives, are immediately concerned with the fortunes of the region under consideration, for at least one third of each of those States lies west of the line laid down as our eastern starting point. It may be safely assumed, then, that if there are sectional and special interests to be legislatively considered, the region indicated will have, as now organized, the support in Congress of at least twenty-four senators and from twenty-seven to thirty-eight representatives. It needs no deep research in the history of politics to establish the formidable possibilities of such a combined vote.

After more than fifty days of constant observation and inquiry, one may well be asked for the most salient fact the journey impressed on those who participated. That question seems easy to answer, and yet when the reply comes to be expressed, there is difficulty in making clear and plain what is felt. But the marvelous change in the character of pioneer life, belongings, and conditions is the one overwhelming fact. To think of towns springing up almost as if overnight; to see comfortable farm houses scattered widely over a new land whose sod was but the previous year, perhaps, turned up for the first time; to see the railroad pushing into, crossing, and conquering the wilderness; to ride, as in one instance we did, through a long mountain tunnel lighted by electricity; to watch from car windows, as we sped in the clear darkness of a California night, the electric lamps that shone over city, town, farm, village, and fruit colony, glowing like stars hung in mid ether; to see the bare brown of the desert transformed into the emerald verdure of vineyard and orange grove; to hear the hum of busy port, of mining town, or lumber camp; more than all, to take note of the intelligence of the bright and brainy young thousands whom everywhere we met—these were impressive experiences indeed. The new population of the newer West is the most marvelous of all its striking features. It would seem in the Dakotas, in Montana, Idaho, and Washington, in the basin region, on the great plains to the center and southward, among the foot hills of the Rockies

and the Sierras, as well as along the coast from Puget Sound to San Diego, as if a draft had been made upon the central States and the old North-west for their younger men and women. There was nothing rustic or unusual either in their dress or ways, and that was not the least of the changes observed. Even the cowboy disappears. There is little of such pioneer life as characterized the "fifties." No less striking is another fact, namely, that there are to be seen but faint traces of the rude life of the old mining camp, or of the louder and coarser vulgarity and license of that carnival of vice and crime which was so marked a feature of the "railroad front" 20 or 25 years ago. The shrill cry of "Keno!" may yet be heard on the streets of some mountain town, as the tourist passes the open or swinging door of a miners' "hell"; but even in such centers of coarse masculinity the echoes grow feebler, and civilization is assuming a show of virtue, "even if it hath it not." The newer Northwest is remarkable for its rapid growth in the amenities as well in the solid externals of material advancement.

One momentous fact must be taken into account first of all, in considering the social-economic forces that are developing within the newer West. The same period which covers the writer's observation of this region, comprises also the culmination of a struggle whose political and social conditions were all controlled by a single series of economic facts. Chattel slavery was made valuable, as such, by the fact that for the period of its dominance cotton was king. Conditions in that case were forced and artificial. In the suggestions about to be made as to a possible regional policy, the fundamental conditions are natural, not artificial; the primary factors are physical—indeed, almost cosmical in character. Economics lie behind all politics. They dominate philosophies and inspire ethical ideals, yet are always themselves the outcome of natural forces and physical conditions.

The newer West preëminently illustrates this. Its physical geography, though vastly diversified in details, is still a stupendous unit. Man may enormously modify the earth's surface by persistent activities, but when they cease, the ameliorations are effaced, and the original physical conditions become again dominant. How often, too, under the best conditions, do they force a

stern recognition of their supremacy! Mountain ranges may be passed or surmounted by man; they have never yet been lowered or removed. The arid interiors, with their basin-like beds of ancient seas or lakes, may be made in some degree subservient to the demands of industry. Across the great plains natural rivers will not run again, at least without the presence of earth-shaping catastrophe. Similar forces must come into play if the now dry belts of mountain streams and the basins of extinct lakes on plateau, range, and table land are ever again to be filled with water. The newer West is mastered by its sublime physical features. These, therefore, must shape its policy and control its relations, integrally, with the rest of the American Union. The chief factor, indeed the dominating one, is that of aridity.

"The arid West" is not a misnomer. From 97° 30′ to the 100th meridian, the sub-humid area east of the Rocky Mountains is well defined. From the 100th to the 126th meridian of west longitude across the continent, with the exception of the north-western section, where the limit is the 124th meridian, as far south as the northern boundary of California, the entire region is an arid one. Within the whole of it, water must be artificially applied to the soil, otherwise fertile, if agriculture and horticulture are to be in any wise successful pursuits. Even the raising of cattle and sheep is limited by this condition of aridity. There are not a thousand miles of navigable waters in the whole region. The rainfall ranges from 2 inches annually in the extreme south-west, to about 20 inches in the farther north-west. Across the continent direct from east to west, the range will be variable from 20 inches annually in the eastern sub-humid area, to about 18 on the plains beyond the 100th meridian; falling thence to 15 inches in the foot-hills, and to 8 or 9 in the basin region; rising again to 16 and 18, or even 24 inches in some localities, as the mountain depressions admit the influence of the Kuro Shiwo, the arctic current, or the trade winds that blow steadily for at least six months in the year from the Pacific Ocean. Another controlling factor in the future development of the newer West is found in a physical or climatic condition, which, broadly stated, is this: on the mountain ranges everywhere throughout its whole extent, the precipitation (rain and

snow) is always from three to five times the number of inches per annum that is recorded as falling on the plains, table lands, valleys, and basins below.

The importance of these facts may be understood more clearly when it is recalled that a precipitation of 28 inches is considered essential to agricultural security. Under irrigation it may fairly be assumed that not over one half of that amount of moisture is essential. The difference lies in the fact that under artificial conditions the application of water to the soil is always made when the same is most needed. The precious eight weeks or so, in which the agriculturist of the far West sees his harvest made or ruined, are exactly those in which the rainfall is most uncertain or entirely wanting. The lack of showers during six weeks of July and August will reduce the wheat crop of the Dakotas by at least one half.

The problems, then, of uncertain rain, nay, of almost complete aridity, are to be solved by permanent storm and flood storage works on a large scale adapted to regional conditions; and this solution can be reached only through the interposition of the whole nation. This statement is of course disputable for constitutional expounders, but facts and the logic of events are all in favor of it. The later highways of the land were unwittingly surrendered to private control, but the safety of the commonwealth is requiring, step by step, the reassumption of its sovereignty over the public function of transportation. Opposition was for years steadily made to appropriations for the improvement of rivers and harbors. All sorts of legal fictions are invented to remove constitutional scruples. It is asserted, and truly, that constitutionally the general government may not exercise police powers; for example, where the State powers are legally paramount. Yet when it was sought to make a national park on the Straits of Mackinaw, at the Sault Ste. Marie, the object was easily obtained, in the face of the non-objecting State and municipal rights of Michigan, by styling the same a military reservation. In like manner, when it shall seem advisable for the general government to undertake the work of reclaiming arid lands, a way will surely be found of reconciling that action with the letter and the spirit of the Constitution

So essential to the newer West is the matter of water-storage on a scale commensurate with the area, that the demand therefor will most certainly shape and give form to all of its public affairs and legislative discussion and action. The sources of the great rivers—the Missouri, the Upper Mississippi, the Columbia, the Colorado, and others—still largely remain as national property. It will become a regional question whether they must so continue. The gravest problems of water-appropriation as well as of water-storage confront the several communities west of the 100th meridian. A glance at the map will show the truth of this. Inter-State appropriations of water cannot be solved by any tribunals other than those that Congress may organize, or by the United States Supreme Court. Artificial political lines must be ignored by the projecting and constructing engineers. They work under unchangeable physical features. The lines of a drainage basin existed before any State was bounded, and will remain after existing State boundaries shall have been forgotten. In the arid West it will be found that the people are not afraid of coöperative government, or opposed to the development of administrative supervision in the directions suggested.

An examination of the Constitutions of the States of Washington, Montana, and North Dakota shows some notable facts. In each of them, as well as in the Constitutions adopted for statehood purposes by the people of Wyoming, Idaho, and New Mexico, are to be found the most stringent provisions yet framed for the control of transportation companies and other corporations whose franchises cover economic functions concerned with the conveniences of the community—as coal-mining, gas and other light supply, street tramways, etc. The community asserts its power of control in the most unmistakable manner. In the same spirit also do these young commonwealths deal with the supply and distribution of water. Like Colorado and California, they declare all natural water supplies within their borders to be public property and under the control of the States. They declare that such water may not be used except for beneficial purposes. Those who for private profit build ditches, in order to bring the waters to the thirsty soil, are in law esteemed only as common carriers, entitled to compensation for the service ren-

dered, and no more. The use of land for water-storage purposes and for right of way is considered a public right; condemnation under eminent domain for such use must follow. Everywhere the tendency in the older irrigable sections is distinctly up to and even beyond State supervision and regulation of water-usage, and to community ownership of water ways and works. There still remains profit, large profit, for the capitalist in the present construction and rapid sale of irrigation works. But those who expect to hold such works as a permanent source of rent, reckon without their host. The water is public property, and communities that require it to make their land useful will surely become the owners of all the works and ways by which it is to be applied where needed.

In forecasting, then, the growth of a distinct policy shaping fresh demands for this newer West, I am first confronted by the overwhelming physical geography of the region; secondly, by the one supreme condition that it creates—aridity; thirdly, by the fact that it is impossible to achieve full reclamation of the desert without concurrent and continued control over the sources of the waters, first by the nation, next by the States affected acting with it, and finally by the local communities into which the States are subdivided. Private ownership of water is already set aside. Private appropriation thereof is already modified by public control of a deficient supply. Private and corporate rental of water is subject to State and county regulation of rates. Private ownership of water works and ditches will soon be a thing of the past. The needs which have already created the beginnings of these policies and purposes will, as fast as the newer West reaches the fullness of statehood, find their counterpart in strenuous demands upon the nation for aid in constructing the greater works needed in a vast system of water-storage and flood-control, such as is certain to be inaugurated. With this, it will be found that a general control of our remaining forest region and timber areas will be demanded by the same physical conditions which must make the newer West a practical unit, both in configuration and in the social-economic forces that will be thereby created and evolved. The railroads beyond the Missouri have already shown their submission to the same controlling law.

Their construction and administration have been carried forward on an immense scale. Unity along the latitudes they serve is absolute; as absolute will be the demand in the newer West for their public ownership. There being no possibility of competition—for there are no navigable water ways—the combination of forces is such as to drive forward the problem of general control.

Though the dominating factors have now been indicated, the brief list does not include all the economic forces and physical facts which must determine the regional necessities of the newer West. Irrigation and reclamation, though supreme, are not the only factors that must be considered; mining and pastoral life and enterprises must also be taken into account. They will both have their say, especially the first named. Mining for the precious metals has already made of the newer West a powerful instrumentality in the making of modern history. It is fast becoming a systematized, scientific pursuit. Even prospecting is being organized. With irrigation from the stored waters of the mining West, the farm will soon be alongside the mine, and the prospector will no longer be at the mercy of the middle man for the necessaries of life. The mining interests of the newer West are sure to be found in the arena of financial politics, fighting for the metal which eastern preponderance has condemned. It will surely startle some complacent monometallists to realize that the stronghold of the bimetallists will be found in the United States Senate. The eight senators from the newly-admitted States are unquestionably radical bimetallists. The three Territories which stand with constitutions in hand awaiting statehood, will give six more senators to the same column. It may with safety be assumed that all the States west of the Mississippi will present an unbroken front for the free coinage of silver. They now number thirty-two senators, and with the three Territories asking admission from Congress, they will soon be thirty-eight—more than two fifths of the body as it will then be constituted.

The newer West, if it can have no interior water traffic, will nevertheless have—indeed already has—a commercial position of vast importance. Years since, a great Russian publicist, Alexander Herven, wrote of the Pacific Ocean as destined to be the new world's Mediterranean. It was pointed out that

nearly one half of the globe's inhabitants were on the Asian side thereof, and were therefore its commercial tributaries. The American shores of the Pacific are to be first considered in all forecasts of commercial progress and power. The people who are making Puget Sound alive with their activities, are surely bound to grasp the traffic of the North Pacific. The men of the Oregon and California coast are not likely to be limited in their industrial ambitions. One of their "captains" holds the Sandwich Islands in his hands, and Samoa will yet, despite the triple protectorate, fall easily under American control—not necessarily governmental, however. No matter what action British or Canadian statesmen may take, and however vast the sums they expend, it will soon be seen in our national councils that the newer West will demand, and that its growing business activity will compel, the absorption, not only of the whole coast from Washington to Alaska, but of at least the north-western portion of the Dominion. British Columbia and all the rest east to Winnipeg will ere long be looking toward a continental union. The same law of physical unity which has been considered as immediately affecting the newer West and its internal polity, must control in the extension of our Republic to the north-west. The peninsula of Lower California will finally follow the same directive impulse.

RICHARD J. HINTON.